Abrasive Disc Performance in Dry-Cutting of Medium-Carbon Steel

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Abrasive-cutting processes are widely used to obtain semi-finished products from metal bars, slabs, or tubes. Thus, the abrasive cutting-off process is applied when requiring precision cutting and productivity at a moderate price. Cut-off tools are discs composed of small abrasive particles embedded in a bonding material, called the binder. This work aims to compare the cutting performance of discs with different composition, in dry cutting of steel bars. To do that, disc wear was measured and disc final topography was digitalized in order to determine both disc surface wear patterns and if the abrasive particles bonding into the binder matrix was affected. In addition, X-Ray inspection gave information about the abrasive grit-binder bonding. Therefore, the method here presented allows identifying discs with a superior abrasive-cutting capability, by combining profilometry and tomography to define micrometrical aspects, grit size, and binder matrix structure. Results led to the conclusion that discs with high grit size and protrusion, high grit retention by bond material, and closer mesh of fiberglass matrix binder were the optimal solution.

2020

METALS

Materials Science
Metallurgy & Metallurgical Engineering

DRY-CUTTING
abrasive-cutting
cutting disc
wear
cut-off abrasive wheel

GRINDING PROCESS
WHEEL
GRAIN
WEAR

ENGLISH

12.03.2021

126
Combined effects of abrasive type and cooling mode on fatigue resistance of AISI D2 ground surface

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This paper explores the benefits of the controlled grinding surface of the AISI D2 steel. The effect of Sol-gel abrasive wheel and cryogenic cooling mode on surface integrity has been proved. These results lead to the higher level of compressive residual stresses and lower density of micro-cracks compared to combination of Al2O3 abrasive wheel and soluble oil cooling mode. Using controlled grinding, the fatigue life has been improved to three time. The Dang Van multiaxial fatigue criterion was used to predict the combined beneficial controlled grinding effects on the high cycle fatigue limit of AISI D2 tool steel.

2020

INTERNATIONAL JOURNAL OF FATIGUE

Engineering
Materials Science

CONTROLLED GRINDING
Residual stress
Micro-cracks
Fatigue
AISI D2

RESIDUAL-STRESSES
STAINLESS-STEEL
CRACK NUCLEATION
WEAR BEHAVIOR
INTEGRITY
STRENGTH
LIFE
TEMPERATURE
IMPROVEMENT
GRINDABILITY

ENGLISH

12.03.2021

127
Coupling Effects of CH₄/H₂/Ar Gas Ratios and Hot Filament-Substrate Distance on the Growth of Nanocrystalline Diamond

Due to the special shape of cutting or grinding tools used nowadays, hot filament (HF)-substrate distance is usually unavoidable during the process of diamond deposition by hot filament chemical vapor deposition (HFCVD), which will lead to difficult deposition process for nanocrystalline diamond (NCD). Based on this problem, the coupling effects of different CH₄/H₂/Ar gas ratios and HF-substrate distances on the growth of NCD films are systematically studied. SEM and Raman are used to analyze the surface morphology and sp(3)/sp(2) contents of the diamond films deposited on different areas of each specimen. The results indicate that the proper increase of HF-substrate distance and concentration of CH(4) or Ar encourage the growth of NCD. Under the condition of lower concentration of CH(4) or Ar, NCD with uniform grain size can also be realized at a certain range of HF-substrate distance. A graph that shows the growth conditions of MCD, MCD/NCD and NCD is creatively presented by summarizing the deposition parameters and experimental results. This work provides a path to coat NCD onto the special-shaped cutting or grinding tools by HFCVD.
DEVELOPMENT OF THE TECHNOLOGY FOR MANUFACTURING AND INTRODUCING A NEW CLASS OF TOOLS WITH CVD DIAMOND FOR GRINDING HIGH-PRECISION GEAR WHEELS OF SPECIAL GEAR UNITS

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Abstrakt
Introduction. The trueing tool used by machine-building enterprises of Ukraine creates a fundamental constraint for improving the accuracy of shaping of the working profile of abrasive wheels and, accordingly, the accuracy of the products made with its use. Problem Statement. The creation of CVD diamonds tools is in the process of being finalized by leading foreign developers. This class of CVD diamond trueing tool has never been developed or manufactured in Ukraine. Purpose. The development of a technology for manufacturing precision products from VD diamond for providing the process of grinding the gear wheels of special reducer units at mechanical engineering enterprises. Materials and Methods. Techniques and special stands for precise positioning of elements from CVD diamond and for testing the trueing instrument, methods for determination of metallic binder’s structure. Results. The rational positioning of CVD diamond elements on the cases of complex shapes has been studied. The manufactured tools for trueing abrasive wheel have been finished and tested. It has been shown that the use of such elements provides a high resistance to the erosion influence of sludge in the trueing area and is expedient to be used in contact with the main components of abrasive wheels, due to exceptional tribological characteristics. The use of structured metallic binders has been shown to provide low vibrations in the trueing area and a stable and reproducible topography of the cutting surface of an abrasive tool with a large number of cutting edges and with the capability of directional influence on the orientation of the edges by selecting efficient trueing conditions. Conclusions. For the first time in Ukraine, at the Bakul Institute for Superhard Materials of the NAS of Ukraine, the truing tools equipped with CVD diamond elements have been created and adapted to the processing chains of high-precision gear wheels of reducer units with enhanced operational characteristics, which enable replacing the imported parts at the machine-building enterprises of Ukraine.

Veröffentlichungsjahr
2020

Quelle
SCIENCE AND INNOVATION

Klassifikation
Science & Technology - Other Topics

Schlagworte des Autors
CVD DIAMOND
structured metallic binders
superhard materials

Thesaurusbegriffe
nicht belegt

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 129
Effect of cutting process on the stress corrosion susceptibility of AISI 304L stainless steel.

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During manufacturing of a component, cutting, turning, grinding, and milling operations are inevitable and these operations induce surface residual stresses. In this study, it is shown that, depending on the process employed for cutting, residual stresses generated at the cut surfaces can vary widely and they can, in turn, make the cut surfaces of austenitic stainless steel (SS) prone to stress corrosion cracking (SCC). An austenitic SS 304L plate was cut using three different processes: bandsaw cutting, cutting using the cut-off wheel, and shearing. Surface residual stress measurement using the X-ray diffraction (XRD) technique is carried out close to the cutting edges and on the cross-section. SCC susceptibility studies were carried out as per ASTM G36 in 45% boiling magnesium chloride solution. Optical microscopic examination showed the presence of cracks, and confocal microscopy was used to measure the depth of cracks. The study confirmed that high tensile residual stresses present in the cut surfaces produced by cut-off wheel and shear cutting make the surfaces susceptible to SCC while the surfaces produced by bandsaw cutting are resistant to SCC. Hence, it is shown that there is a definite risk of SCC for product forms of austenitic SS with cut surfaces produced using cutting processes that generate high tensile residual stresses stored for a long period of time in a susceptible environment. Copyright Wiley-VCH Verlag GmbH & Co. KGaA. Reproduced with permission.

Veröffentlichungsjahr
2020

Quelle
Materials and Corrosion * Band 71 (2020) Heft 7, Seite 1081-1090 (10 Seiten, 10 Bilder, 2 Tabellen)

Klassifikation
3KEB Staehle, Stahlguss
3LKB Spanende Bearbeitung, Zerspanen, Zerteilen
3KXU Chemische Werkstoffeigenschaften, Korrosions- und Erosionsverhalten

Schlagworte des Autors
Magnesiumchlorid
Eigenspannung
Chrom-Nickel-Stahl
nichtrostender Stahl
Spannungsrisskorrosion
Spannungskorrosion
Scheren
Roentgendiffraktion
Oberflaechenspannung
Bandmesser
Trennscheibe
Rissstiefe
Zugspannung
austenitischer nicht rostender Stahl
konfokale Mikroskopie

Thesaurusbegriffe
nicht belegt

Sprache
Englisch
Titel
Influence of the cutting direction angle on the tool wear behavior in face plunge grinding of PcBN

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Abstrakt
Polycrystalline cubic boron nitride (PcBN) is a highly wear resistant material. Due to its high hardness this material is typically machined with diamond grinding tools. The high hardness and high-temperature hardness of PcBN leads to a significant grinding tool wear. The applied cutting direction angle during face plunge grinding offers the possibility to influence the geometry of the contact area between the grinding tool and the PcBN workpiece. However, the underlying principal mechanisms and influences of parameters are not fully understood today. The contact zone geometry is described by the width of cut and the geometric contact length. The paper provides a mathematical description of these two parameters for S-shapes PcBN cutting inserts depending on the workpiece geometry and the cutting direction angle. It is shown that the contact length significantly determines the wear mechanism.

Veröffentlichungsjahr
2020

Quelle
WEAR

Klassifikation
Engineering
Materials Science

Schlagworte des Autors
GRINDING
PcBN
Tool wear
Cutting mechanisms
Vitrified bond

Thesaurusbegriffe
nicht belegt

Sprache
ENGLISH

Recherchdatum
12.03.2021

Dokument Nr. 131
Titel
Effects of electric discharge dressing parameters on polycrystalline diamond micro-tool surface topography and their micro-grinding performances

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Abstrakt
Polycrystalline diamond (PCD) micro-grinding tools are shaped by using different electro-discharge machining processes, among which wire electro-discharge grinding (WEDG) process is widely accepted due to its capability of producing highly precise, ultra-thin and dimensionally accurate tools. Observing the effects of different WEDG conditions on the tool surface and analyzing the tool's topographic features relevant to micro-grinding are of utmost importance. Current study deals with dressing of polycrystalline diamond tool blanks at different combinations of wire tension and discharge energy to observe the effects of dressing parameters on the tool surface morphology and statistics. Surface roughness, ridge type surface defects and diametrical error in the fabricated tool are analyzed with respect to discharge energy and wire tension. High wire tension produces tools with consistence surfaces and desired diameter. Binder material cobalt is efficiently melted and flushed out from the tool surface at high wire tension, which leads to proper segregation and protrusion of diamond abrasives from the surface. Static abrasive grit density measured by processing the 3D surface data of the tool is found to be approximate to 165-170 per mm, as compared to theoretically determined value of approximate to 200 per mm. Micro-slot grinding experiments are carried out on BK7 glass, to quantify the effects of the dressing parameters on the micro-grinding performances of the PCD micro-tools. Cutting forces for all the tools are found to be within 1 N whereas normal force exceeds beyond 1 N. Cutting forces are found to be higher for the tools dressed at high wire tension due to large diameter of the tool as compared to that of undersized tool obtained at low wire tension. Cutting nature is found to be mix of ductile-brittle for the machining conditions adopted in this paper.

Veröffentlichungsjahr
2019

Quelle
INTERNATIONAL JOURNAL OF REFRACTORY METALS & HARD MATERIALS

Klassifikation
Materials Science
Metallurgy & Metallurgical Engineering

Schlagworte des Autors
PCD MICRO-TOOL
WEDG
Discharge energy
Watershed algorithm
Grit density
Surface roughness

Thesaurusbegriffe
GLASS
PARALLEL
BRITTLE
PCD

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 132
Titel
Fabrication of novel resinous diamond composites with acrylonitrile butadiene styrene/polyvinyl chloride/dioctyl phthalate/diamond by hot pressing molding

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Abstrakt
Uniform distribution of diamond grains is difficult to achieve using traditional fabrication of the micro grinding wheel. The design and performance of novel resinous diamond composites (RDCs) fabricated by hot pressing molding were studied to fabricate micro resinous diamond grinding wheels. The physical and mechanical properties of RDCs were analyzed by constructing and simulating five kinds of RDCs, including acrylonitrile butadiene styrene (ABS)/polyvinyl chloride (PVC)/dioctyl phthalate (DOP)/diamond materials with different mass ratios. Diamond grains presented good compatibility with the ABS-PVC-DOP copolymer, which resulted in improved mechanical properties of RDCs. RDC1-RDC5 samples were fabricated, and their hardness, surface roughness, and infrared spectra were analyzed. The optimal mass ratio of ABS/PVC/diamond/DOP for fabricating RDCs was 62.5/18.6/10.6/8.3. The results provide guidance in fabricating novel materials for resinous diamond grinding wheels with desirable performances for precision and ultraprecision machining.

Veröffentlichungsjahr
2019

Quelle
JOURNAL OF MATERIALS RESEARCH

Klassifikation
Materials Science

Schlagworte des Autors
POLYMER
simulation
hot pressing

Thesaurusbegriffe
MECHANICAL-PROPERTIES
GRAPHENE OXIDE
ABS
FORCE
SIMULATION
DENSITY
COMPASS

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 133
Titel
Improving the effectiveness of combined grinding processes for processing superhard materials

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Abstrakt
Metal bond diamond grinding wheels, which are used to process superhard materials, maintain their cutting ability through an electrochemical process that removes the bonds to reveal new grains on the working surface. The effectiveness of this method can be improved by increasing the material removal rate and decreasing the consumption of grinding grains through the introduction of a periodic impact load on the wheel. A proof-of-concept laboratory device was prepared, and experiments were carried out with the application of constant or periodic pressure. The experimental results clearly indicate up to a 1.8-fold increase in the material removal rate and up to a 1.9-fold decrease in the specific consumption of diamonds using the proposed periodic pressure method instead of the method with a constant load. By suitably altering the amplitude and frequency of the periodic load, a nearly 10-fold increase in the removal rate and decrease in the diamond consumption can be achieved. Furthermore, the study reveals the optimal conditions for practical implementation of the process. The analysis indicates that through the application of a periodic load with controlled amplitude and frequency on a wheel, better and more efficient use of a grinding wheel can be achieved, leading to a significant reduction in the specific cost of the wheel dressing procedure.

Veröffentlichungsjahr
2019

Quelle
JOURNAL OF MANUFACTURING PROCESSES

Klassifikation
Engineering

Schlagworte des Autors
SUPERHARD MATERIALS
Synthetic polycrystalline diamond
Diamond wheel
Grain self-sharpening
Percussion load
Contact pressure

Thesaurusbegriffe
DIAMOND GRAIN
WHEEL
SIMULATION
MECHANISM
WEAR

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 134
Titel
Morphological evolution and grinding performance of vitrified bonded microcrystal alumina abrasive wheel dressed with a single-grit diamond

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Abstrakt
Dressing experiments under different conditions were carried out on a vitrified bonded microcrystal alumina abrasive wheel with a single-grit diamond dresser. The grinding performance of the as-dressed abrasive wheels was investigated. The dressing force, grinding force and the surface morphology of abrasive wheel and machined workpiece were studied to shed light on the relationship among the dressing processing vectors, morphology of abrasive wheel and the grinding performance. The results obtained show that the dressing forces increase with the increasing volume of the abrasive wheel material removed per unit time. The sensitive analysis reveals that the dressing feed speed take a greater effect than the single dressing depth on the dressing force. The self-sharpeness of vitrified bonded microcrystal alumina abrasive wheel brings into some functions under certain dressing conditions, but a deep dressing depth would lead to an excessive abrasive self-sharpeness, i.e. abrasive grits fall off and embed into the workpiece surface.

Veröffentlichungsjahr
2019

Quelle
CERAMICS INTERNATIONAL

Klassifikation
Materials Science

Schlagworte des Autors
MICROCRYSTAL ALUMINA ABRASIVE
Dressing
Single-grit diamond
Dressing force
Surface morphology

Thesaurusbegriffe
PROCESS MODEL
WEAR
PARAMETERS
TOPOGRAPHY
MICROSTRUCTURE
GRINDABILITY
MECHANISMS
INTENSITY
BEHAVIOR
STRESS

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr.
135
Titel
Progress in pressureless sintering of boron carbide ceramics - a review

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Abstrakt
Boron carbide (B4C) ceramics has many outstanding performance, such as extremely high hardness, low density, high melting point, high elastic modulus, high thermoelectromotive force, high chemical resistance, high neutron absorption cross section, high impact and excellent wear resistance. Therefore, B4C ceramics can be used in various industrial applications, such as lightweight ceramic armour, high temperature thermocouples, neutron absorber, reactor control rods in nuclear power engineering, polishing media for hard materials, abrasive media for lapping and grinding, and wear resistant components (blasting nozzles, die tips and grinding wheels). Pressureless sintering is the method with industrialised application value for B4C ceramics, however, it is impossible to sinter pure B4C ceramics to high densities without additives by pressureless sintering. So sintering additives must be used to promote the densification of B4C ceramics. The different sintering additives used to promote the densification of boron carbide will be described in this review, including carbon additives, metallic additives, oxide additives, non-oxide additives, combined additives and rare earth oxide additives. Finally, the recent research trends for sintering methods and sintering additives of B4C ceramics will also be proposed.

Veröffentlichungsjahr
2019

Quelle
ADVANCES IN APPLIED CERAMICS

Klassifikation
Materials Science

Schlagworte des Autors
BORON CARBIDE (B4C)
pressureless sintering
additive
relative density
mechanical property

Thesaurusbegriffe
MECHANICAL-PROPERTIES
B4C-TIB2 COMPOSITES
SIC CERAMICS
MICROSTRUCTURE
DENSIFICATION
B4C
BEHAVIOR
HARDNESS
STRENGTH
RESISTANCE

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 136
Towards the understanding of creep-feed deep grinding of DD6 nickel-based single-crystal superalloy

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DD6 nickel-based single-crystal superalloy has been treated as an ideal material for the high-valued and high-performed aero-engine components; however, it was found difficult to remove material from the DD6 nickel-based single-crystal superalloy in cutting and grinding. Although creep-feed deep grinding (CFDG) has been widely employed for various nickel-based superalloys (i.e., Inconel 718, DZ4, IN738LC), very few efforts however have been focused on the nickel-based single-crystal superalloy. With this, this paper focuses on CFDG of DD6 nickel-based single-crystal superalloy to gain the more in-depth understandings, targeting grinding force, specific grinding energy, grinding temperature, surface integrity, and wheel wear condition. Scheduled experimental observation proved that (i) microcrystalline alumina abrasive wheel generally shows more superior grinding performances in aspect to grinding force, force ratio, and specific grinding energy than that of brown alumina abrasive wheel; (ii) grinding temperature is decreased by 35% by using the microcrystalline alumina abrasive wheel compared to brown alumina abrasive wheel, and therefore the microcrystalline alumina abrasive wheels have the potential to be applied in the high-efficiency grinding; (iii) the surface ground by the microcrystalline alumina abrasive wheel is found smooth without any grinding-induced damage; and (iv) microcrystalline alumina abrasive wheels easily lead to micro-fractures and therefore result in better self-sharpness ability and longer service life in CFDG of DD6 nickel-based single-crystal superalloy.

Veröffentlichungsjahr
2019

Quelle
INTERNATIONAL JOURNAL OF ADVANCED MANUFACTURING TECHNOLOGY

Klassifikation
Automation & Control Systems
Engineering

Schlagworte des Autors
SINGLE-CRYSTAL SUPERALLOY
Creep-feed deep grinding
Alumina abrasive wheel
Grinding force
Grinding temperature

Thesaurusbegriffe
OF-THE-ART
SURFACE INTEGRITY
TEMPERATURE

Sprache
ENGLISH

Recherchedatum
12.03.2021
Titel
Wear mechanisms of CVD diamond tools for patterning vitrified corundum grinding wheels

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Abstrakt
Grinding is one of the last manufacturing steps in the production chain of modern workpieces. Thus, product quality is more important compared to the productivity and is therefore the limiting factor. Exemplarily, thermal load due to the grinding process leads to thermal induced damage such as grinding burn or tensile residual stresses. Previous studies showed the capability of grinding wheels with mechanically induced patterns to reduce the thermal load on a workpiece throughout the grinding process. In this paper the patterning tool is investigated in regard to the grade of CVD thick layer diamond (CVD-D). In detail, three CVD-D grades are investigated in terms of their features and their wear mechanisms. SEM and X-Ray diffractometry as well as Raman measurements are conducted. A wear mechanism of surface fatigue is found to be dominant. Pole figures as well as the microscopic measurements indicate a correlation between the texture of the CVD-D grade and the wear extension.

Veröffentlichungsjahr
2019

Quelle
WEAR

Klassifikation
Engineering
Materials Science

Schlagworte des Autors
nicht belegt

Thesaurusbegriffe
RESIDUAL-STRESS
RAMAN-SPECTROSCOPY

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 138
An experimental study of the effects of dressing parameters on the topography of grinding wheels during roller dressing

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Vitreous-bonded grinding wheels are widely used for machining features on aerospace components achieving high material removal rates under high pressure coolant. Dressing is a vital stage in the grinding process to ensure a consistent wheel topography and performance. However, the effects of roller dressing on functional performance of vitreous grinding wheels as well as its influence on different abrasive grit morphologies have not been fully characterised. This paper studies the influence of dressing parameters on the topography, morphology and characteristics of the surface of different vitrified abrasive wheels in order to better understand the process and therefore optimise the preparation of grinding wheels for industrial machining. Alumina grinding wheels with conventional and engineered grit shapes were dressed at two different infeed rates over a range of seven different speed ratios (from -0.8 to +1). An experimental methodology has been developed incorporating a range of known techniques to define the abrasive wheel condition including measured power consumption and ground graphite coupons as well as using optical microscopes to measure grain fracture flats, peak density and abrasive grain shape. It has been found that power consumption of the grinding wheel spindle increases at higher infeed rates and speed ratios. This leads to increased fracturing of the grains and whole-grain pull out. According to the results the infeed rate has a more substantial effect on wheel topography than speed ratio and the response of engineered grit morphologies to dressing is dependent on grit orientation. (C) 2017 The Society of Manufacturing Engineers. Published by Elsevier Ltd. All rights reserved.

2018

JOURNAL OF MANUFACTURING PROCESSES

Engineering

DRESSING
Grinding
Topography

SURFACE MEASUREMENT TECHNIQUES
WEAR
GENERATION
SIMULATION
MODEL

ENGLISH

12.03.2021

139
Analysis of rectangular-profiled high-strength grinding wheels designed for crankshaft grinding applications

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The continued development of high-speed rotating grinding wheels for grinding crankshafts has led to the use of high-performance materials such as carbon fiber matrix structures with abrasive segments bonded to them. The use of porous reinforcing centers in order to improve safety and increase rotational speed to gain the benefits associated with high-speed grinding is investigated. A 2-D finite-element model is developed which calculates rotational stresses and compares them with stresses predicted using closed-form solutions developed by Chree and Frost and Whitcomb for rotating rings. A 3-D finite-element model is developed for more complex grinding wheels that contain a porous reinforcing center that predicts stresses and deflections with remarkable accuracy. The paper also takes account of the strength of biaxially stressed brittle abrasive materials where the geometry of segments differs significantly from the prismatic geometry associated with flexural bending strength test pieces that are subjected to three-point loading conditions. Owing to lower design stresses and associated rotational speeds with high survival probability of ceramic abrasive structures (> 99.99%), it is assumed that the failure of abrasive segments is dominated by volume and/or surface flaws. The results predict accurate safety factors than previously calculated owing to the geometry of the abrasive segment loaded under plane stress conditions. The paper will be of interest to manufacturers who design and make such complex grinding wheel structures.
CROSSING AXES OF WORKPIECE AND TOOL AT GRINDING OF THE CIRCULAR TROUGH WITH VARIABLE PROFILE

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In the article the method of grinding with crossed axes of the tool and the workpiece got further developed. The work discloses a method of processing details having an external surface with a profile in the form of an arc of a circle of variable radius (for example, rolls of pipe rolling mills). The particular three-dimensional geometric models of the processing, shaping and profiling of abrasive wheels have been developed. A method for controlling the grinding process, which ensures the removal of allowances along equidistant curves has been offered. The developed method of grinding provides a constant depth of cutting according to the coordinate of profile processing. This is achieved at the expense of the synchronous inclination of the wheel and its insertion by the size of the allowance. The diameter of grinding wheel affects on the maximum angle of orientation of the wheel has been proven. It has been shown that increasing the diameter of the abrasive wheel has led to a slight decrease in value orientation angle.

Veröffentlichungsjahr
2018

Quelle
ACTA MECHANICA ET AUTOMATICA

Klassifikation
Engineering

Schlagworte des Autors
CIRCULAR TROUGH
Grinding
Equidistant Curves
Cutting Edge
Abrasive Surface
Abrasive Materials
Crossed Axes
Abrasive Wheel
Orientation Angle
Grinding Performance

Thesaurusbegriffe
SIMULATION
MODEL

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 141
Cylindrical plunge grinding of twist free surfaces by structured wheels

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The high specific energy expended in grinding leads to large heat generation in contact zone of grinding wheel and workpiece, which is the great challenge in the grinding. Aiming to reduce the grinding forces and temperature, employing structured wheels has lately become a subject of special interest. Creation of spiral form structures on the surface of grinding wheels is one of the structuring methods showing great advantages in grinding in terms of grinding force and temperature reduction. However, transfer of the spiral form of the wheel surface to the workpiece surface is a problem with this method. This paper focuses on grinding of twist free surfaces by structured grinding wheels. The kinematics of grinding by the structured wheels was analyzed and simulated with the help of MATLAB. It was found that the ratio of the grinding wheel rotational speed to the workpiece rotational speed plays the key role in grinding of twist free surfaces. The experimental results proved that using the kinematic simulation, the appropriate grinding parameters could be derived to grind a twist free surface.

Veröffentlichungsjahr
2018

Quelle
PRECISION ENGINEERING-JOURNAL OF THE INTERNATIONAL SOCIETIES FOR PRECISION ENGINEERING AND NANOTECHNOLOGY

Klassifikation
Engineering
Science & Technology - Other Topics
Instruments & Instrumentation

Schlagworte des Autors
TWIST FREE
Lead free
Structuring grinding wheels
Cylindrical grinding

Thesaurusbegriffe
TOOLS

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 142
Influence of high-energy ball milling and additives on the formation of sphere-like alpha-Al2O3 powder by high-temperature calcination

LI SAI
Zhu Lingling
Liu Luoqiang
Chen Liugang
Li Hongxia
Sun Chunhui

In comparison with the typically worm-like alpha-Al2O3 powders formed from an unground Al(OH)(3) precursor calcined at 1450 degrees C, spherical alpha-Al2O3 powders with similar to 1 μm in size were prepared by the calcination of a ground Al(OH)(3) precursor with 5 wt.% [NH4][BF4] under the same calcination conditions. The influence of a high-energy ball milling pretreatment as well as of the additives on the morphological evolution of alpha-Al2O3 powders was studied using the commercial precursor Al(OH)(3) as raw material. The results indicate that the morphology of alpha-Al2O3 powders is closely related to the morphology of the Al(OH)(3) precursor and to the introduction of different additives. The refinement of the Al(OH)(3) precursor in aggregate size and of the primary crystal size by high-energy ball milling has effectively suppressed the neck growth of alpha-Al2O3 grains. In contrast to the findings made previously with the introduction of 5 wt.% [NH4][Cl]-, the morphology of the alpha-Al2O3 particles could be significantly improved from a ground Al(OH)(3) precursor with the addition of 5 wt.% [NH4][BF4]-, which resulted in the formation of spherical alpha-Al2O3 powders with 1 μm size at 1450 degrees C.
A new algorithm to solve the grinding wheel profile for end mill groove machining

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Groove is one of the key structures of end mills. Some of them could be machined by standard grinding wheels (1A1 or 1V1 type), some others must design new wheel profiles. Based on the enveloping and analytic geometry theories, a novel algorithm was proposed to calculate the wheel profiles for special groove machining. The machining process was analyzed, the contact line principles were discussed, and the calculation procedure was detailed. In addition, the algorithm was implemented on a personal computer by using the MATLAB programming language. Therefore, the desired wheel profile could be computed automatically with four input parameters, namely, the groove lead, the wheel axial vector, the point coordinates on the wheel axis, and the discrete points on the groove profile (or groove profile expression). The proposed algorithm and the corresponding program were finally verified by three different examples. The results demonstrated good agreements with the practical wheel profiles.

INTERNATIONAL JOURNAL OF ADVANCED MANUFACTURING TECHNOLOGY

Automation & Control Systems
Engineering

ENVELOPING
Contact line
Wheel profile
End mill
Groove machining

DESIGN
SIMULATION
CARBIDE
TOOLS

ENGLISH

12.03.2021

144
Activation of Magnesium Lignosulfonate and Kraft Lignin: Influence on the Properties of Phenolic Resin-Based Composites for Potential Applications in Abrasive Materials

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Magnesium lignosulfonate and kraft lignin were activated by different oxidizing agents for use in phenolic resin composites used for the production of abrasive components. The physicochemical properties of the oxidized materials were analyzed by Fourier transform infrared spectroscopy (FTIR), X-ray photoelectron spectroscopy (XPS), dynamic mechanical-thermal analysis (DMTA) and inverse gas chromatography (IGC). The homogeneity of the model abrasive composites containing the studied products was assessed based on observations obtained using a scanning electron microscope (SEM). FTIR and XPS analysis of the oxidized products indicated that the activation process leads mainly to the formation of carbonyl groups. The IGC technique was used to assess changes in the surface energy and the acid-base properties of the studied biopolymers. The changes in the acid-base properties suggest that more groups acting as electron donors appear on the oxidized surface of the materials. DMTA studies showed that the model composites with 5% magnesium lignosulfonate oxidized by H2O2 had the best thermomechanical properties. Based on the results it was possible to propose a hypothetical mechanism of the oxidation of the natural polymers. The use of such oxidized products may improve the thermomechanical properties of abrasive articles.
Experimental and modeling characterization of wear and life expectancy of electroplated CBN grinding wheels

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Wear and life expectancy of a nickel-electroplated monolayer of cubic boron nitride grinding wheels are characterized based on the wheel surface topological evolution, observed after grinding Inconel 718 super alloys. The wheel is for surface or cylindrical grinding, and having 250 mm diameter, 10 mm thickness and B40/50 coarse grit size. A unique grit-workpiece interaction process, leading to a non-uniform spatial distribution of the grit wear has been identified. Largest grits have been observed to pullout rapidly, resulting in load redistribution to their surroundings, and leading to the attritious and fracture wear phase. The detailed analysis showed that the stresses on the cutting grits arising from the thermal shock are 3-5 folds those arising from mechanical cutting forces, and reach an order of magnitude differences for the high efficiency deep grinding (HEDG) process. It is also found that the grit wear rate is primarily dependent on the workpiece feed rate rather than the grinding wheel speed. The total wheel life is then constructed as the sum of pullout life (Phase-I) and attritious and fracture wear life (Phase-II). Model predictions for the total wheel life compare well to the experimental observations. This facilitates comparisons of different types of grinding configurations and design space exploration. As an example, the HEDG process is compared to a regular high speed grinding, and it is observed that HEDG configuration can deliver much higher material removal for the same amount of wheel wear.

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Quelle
INTERNATIONAL JOURNAL OF MACHINE TOOLS & MANUFACTURE

Klassifikation
Engineering

Schlagworte des Autors
GRINDING WHEEL WEAR
Cubic boron nitride
Nickel alloys
Life expectancy
Monolayer electroplated super-abrasive
High speed grinding

Thesaurusbegriffe
BONDING MECHANISM
SILICON-NITRIDE
DIAMOND WHEELS
PART 1
STRESSES
GRAINS
TOOLS
PERFORMANCE

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 146
Experimental and numerical analysis of thermal phenomena in the wear of single point diamond dressing tools

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Grinding technologies represent a critical step in the production of high added-value and high precision parts for strategic industrial sectors such as aerospace, automotive, biomedical, and wind generation. Whilst a number of factors related to the grinding wheel are important for optimizing the grinding process, there is no doubt that the wheel surface topography is the most influential factor. Surface topography is induced not only by the nature of the wheel itself, but also, more importantly, by the dressing process. Dressing is periodically carried out in order to recover the abrasive capacity of the wheel once excessive wear of abrasive grits has occurred. The high temperatures and contact forces present in dressing lead to wear of the diamond dressing tool, which in turn damages the topography of the wheel surface. Although the scientific literature has paid attention to the phenomena involved in dressing tool wear, some issues are still in need of explanation. Thus, the aim of the present study was to address the unresolved issue concerning the relationship between dressing temperatures and dressing tool wear. Using a combined empirical and modeling approach, the work reported here shows that temperatures on the surface of the dressing tool can be reduced by as much as 35% when using high conductivity materials in the tool holder. In addition, a methodology has been devised in order to estimate accurate values of the heat partition ratio towards the diamond dressing tool. The results show that the heat partition depends primarily on the dressing mechanism involved. Its values range from 0.97 (when friction between the dressing tool and the grinding wheel prevails) to 0.54 when grain breakage and pull-out occur at higher dressing depths. It has been analyzed and measured the wear suffered by the diamond under interesting designed tests. It has been demonstrated that the effective reduction of temperatures during process led us to take a lower wear rate of the diamond. (c) 2017 The Society of Manufacturing Engineers. Published by Elsevier Ltd. All rights reserved.
Titel
Experimental investigation on high-efficiency grinding of Inconel 718 with heat pipe grinding wheel

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Abstrakt
Grinding heat is a significant problem for grinding difficult-to-machine materials such as nickel-based superalloys, which restricts their applications. A majority of existing cooling methods ensure cooling by simply increasing the volume of coolant. However, lubricants often lose efficacy due to film boiling and have adverse health and environment effects. To dissipate grinding heat in the contact zone and guarantee workpiece surface quality, a novel cooling method that dissipates grinding heat assisted by forming rotating heat pipe inside the grinding wheel (HPGW) is proposed. Tests were performed to determine its heat transfer capacity in high-efficiency grinding of Inconel 718 alloy. The results show that grinding with HPGW leads to lower grinding temperatures and lower thermal damages to the workpiece when compared to grinding with non-HPGW. Better heat transfer capacity of HPGW is explained by heat transfer resistance analysis for both grinding wheels. The analysis proves that the value of HPGW is one order of magnitude lower than non-HPGW. Furthermore, in-depth studies of the ground surface showed no changes in microstructure or microhardness for the workpiece when using HPGW, whereas different degrees of burn were seen as indicated by different temper colors and corresponding changes in microstructure and microhardness.

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Quelle
MACHINING SCIENCE AND TECHNOLOGY

Klassifikation
Engineering
Materials Science

Schlagworte des Autors
INCONEL 718 ALLOY
grinding heat
coolant
heat pipe grinding wheel

heat transfer resistance
microhardness
microstructure

Thesaurusbegriffe
nicht belegt

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 148
Titel
High-performance grinding of a 2-m scale silicon carbide mirror blank for the space-based telescope

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Abstrakt
Silicon carbide (SiC) is a competitive candidate material for building the space-based reflecting mirrors. However, SiC is also a typical difficult-to-machine material due to its extreme hardness. When SiC workpiece is machined by grinding, the wheel wears rapidly which leads to a deterioration of surface form accuracy. Grinding efficiency also becomes extremely low due to the frequent truing and dressing of grinding wheels. To achieve high-performance grinding process capable of producing accurate surface at high grinding efficiency, an ultrasonic vibration-assisted fix-point grinding technology was developed in this study. Wheel wear observation indicated that the wheel needs not to be dressed during the whole grinding cycle. Moreover, a laser tracker was used to achieve an on-machine measurement of the surface form error. A CNC tool microset was adopted to evaluate the wheel wear amount. On the basis of the above two results, surface form error could be predicted before grinding, and thus, an in-process compensation of surface form error was carried out. Using the above-mentioned grinding strategies, a SiC mirror blank with an aperture diameter of 2 m was successfully ground to a form accuracy of 18 μm in peak-to-valley (PV). Therefore, this work provides an efficient and economical solution for grinding the large-scale SiC aspherical surfaces.

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Klassifikation
Automation & Control Systems
Engineering

Schlagworte des Autors
HIGH-PERFORMANCE GRINDING
Wheel wear compensation
Five-axis machining
Tool path generation
Reaction-bonded SiC

Thesaurusbegriffe
SURFACE-ROUGHNESS
SUBSURFACE DAMAGE

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 149
A picosecond laser is utilized for microstructuring of a metal-bonded cBN grinding wheel. Two types of structure, both with 15% reduction of the wheel surface area, but with different patterns are produced. The effect of structuring on surface roughness and grinding forces in the cylindrical plunge grinding of 100Cr6 is studied. Reducing the abrasive layer area (15% reduction of the wheel surface area) causes the reduction of grinding forces up to 60%, while the roughness values increase up to 30%. The concentrated structuring approach led to better structure persistence of the wheel structure in comparison with the uniformly distributed structure. Furthermore, temperature measurement demonstrated that microstructuring leads to reduced wheel and workpiece contact zone temperatures.
A novel ultrasonic-assisted dressing method of electroplated grinding wheels via stationary diamond dresser

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To achieve fine surface roughness, tungsten carbides are mostly ground with resin or vitrified bonded diamond wheels. The use of cost-effective electroplated diamond tools (single layer) is, despite some specific improvements, such as geometrical flexibility, excellent profile holding, large chip spaces and good cooling characteristics, which allows even dry grinding processes, unusual when fine surface roughness is desired. It is generally due to the high grain protrusion (approx. 40 % compared to approx. 15 % with resin bonded or vitrified diamond wheels) which leads to the induced grooves on the ground surface combined with high surface roughness. Another disadvantage of single-layer bonded grinding wheels is their low range of dress ability. This article describes a possibility to overcome the drawbacks of the electroplated grinding wheels by ultrasonic-assisted fracturing of the diamond grains. For this purpose, an ultrasonic-assisted stationary dresser is used. The ultrasonic unit generates hits on the diamond grains. The grinding wheel rotates with a very slow circumferential speed, which is uncommon in conventional dressing methods, so that the grains are fractured by the oscillating movement of the dresser. However, numerous sharp cutting edges are generated due to the generated hits. This method allows the generation of cutting edges on relatively coarse grain sizes (in this case, D251) that have the properties of smaller grain sizes, and therefore, surfaces with lower roughness values are produced while the advantages of the electroplated grinding wheels, such as good profile keeping and good cooling characteristic, are maintained. Additionally, the service life of the electroplated wheel can be increased and the grinding parameters can be kept nearly constant. Experimental analyses have shown that the grinding of tungsten carbide with fractured electroplated D251 diamonds enables fine surface roughness from Ra < 0.1 \( \mu \)m and Rz < 0.8 \( \mu \)m.

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Quelle
INTERNATIONAL JOURNAL OF ADVANCED MANUFACTURING TECHNOLOGY

Klassifikation
Automation & Control Systems
Engineering

Schlagworte des Autors
DRESSING
Ultrasonic-assisted dressing
Electroplated diamond grinding wheel
Grinding
Tungsten carbide
Fracturing of diamonds

Thesaurusbegriffe
TUNGSTEN CARBIDE
SMALL HOLES
VIBRATION
PERFORMANCE
WEAR

Sprache
ENGLISH

Recherchedatum
12.03.2021
Titel
Application potential of coarse-grained diamond grinding wheels for precision grinding of optical materials

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Abstrakt
Fine-grained resin bonded diamond tools are often used for ultra-precision machining of brittle materials to achieve optical surfaces. A well-known drawback is the high tool wear. Therefore, grinding processes need to be developed exhibiting less wear and higher profitability. Consequently, the presented work focuses on conditioning a mono-layered, coarse-grained diamond grinding wheel with a spherical profile and an average grain size of 301 μm by combining a thermo-chemical and a mechanical-abrasive dressing technique. This processing leads to a run-out error of the grinding wheel in a low-micrometer range. Additionally, the thermo-chemical dressing leads to flattened grains, which supports the generation of hydrostatic pressure in the cutting zone and enables ductile-mode grinding of hard and brittle materials. After dressing, the application characteristics of coarse-grained diamond grinding wheels were examined by grinding optical glasses, fused silica and glass-ceramics in two different kinematics, plunge-cut surface grinding and cross-grinding. For plunge-cut surface grinding, a critical depth of cut and surface roughness were determined and for cross-grinding experiments the subsurface damage was analyzed additionally. Finally, the identified parameters for ductile-machining with coarse-grained diamond grinding wheels were used for grinding a surface of 2000 mm² in glass-ceramics.

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Quelle
PRODUCTION ENGINEERING-RESEARCH AND DEVELOPMENT

Klassifikation
Engineering

Schlagworte des Autors
ULTRA-PRECISION GRINDING
Coarse grains
Subsurface damage
Optical materials

Thesaurusbegriffe
GLASSES

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 152
Title
Comparison of Cu and Zn on properties of vitrified diamond composites

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Abstract
The microstructures and properties of vitrified diamond composites, which are composed of diamond grains and vitrified bonds with varying Cu and Zn doping amounts, were comprehensively investigated in this work. The results including TG curves indicated that compared with Zn, Cu powders were more beneficial to prevent the oxidation of diamond. Both of them could consume oxygen and be oxidized to CuO or ZnO, which would enter into the glass network but not damage the structure. Hence, the vaporization of metals, especially Zn, would remain tiny voids and the lower refractoriness could easily lead the glass to foam. The incorporation of Cu or Zn in appropriate amounts (4 wt.%) not only decreased the refractoriness of vitrified bonds but also increased the wettability between diamond grains and vitrified bonds. The flexural strength of the diamond composites incorporating 4 wt.% Cu could reach 60.35 MPa, which increased by about 19.6% than the basic diamond composite and its growth rate was also higher than the value of composites containing 4 wt% Zn (7.8%). In general, the addition of Cu played greater role than Zn on the protection of diamond grains and properties of vitrified diamond composites. (C) 2016 Elsevier B.V. All rights reserved.

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Quelle
DIAMOND AND RELATED MATERIALS

Klassifikation
Materials Science
Physics

Schlagworte des Autors
DIAMOND COMPOSITES
Metals
Oxidation
Flexural properties

Thesaurusbegriffe
THERMAL-CONDUCTIVITY
MECHANICAL-PROPERTIES
SINTERING PARAMETERS
GRINDING WHEELS
BOND
TOOLS
WETTABILITY
STRENGTH
BEHAVIOR
BIO3

Sprache
ENGLISH

Recherchedatum
12.03.2021
Titel
Fabrication and evaluation of micromill-grinding tools by electroplating CBN

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Institution

Abstrakt
The micromill-grinding tool is a compound tool that has both micromilling and microgrinding abilities. Local electroplating was employed to fabricate micromill-grinding tools with CBN abrasive. The grits topography of the flank face was measured, and the graphical investigation was carried out to evaluate the distribution of the grits. It is found that the coatings were well electroplated and the abrasive grains were distributed more evenly on the 1.5-mm tool than on the 0.9-mm tool. The experiments were performed to evaluate the machining characteristics of the micromill-grinding tool. The machined surface roughness and the forces were measured, and the effects of processing parameters on surface roughness were analyzed. The tool wear style was investigated. The results show that the surface topography of micromill-grinding is similar to that of microgrinding. Under the same conditions, its surface roughness is better than that of micromilling, but worse than that of microgrinding. The grits on the tool flank face lead to the decrease of the normal force but the increase of the tangential force in machining. The wear style of micromill-grinding tool is mainly abrasive grain shedding.

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Klassifikation
Automation & Control Systems
Engineering

Schlagworte des Autors
MICROMILL-GRINDING
Tool fabrication
Grain topography
Surface roughness
Force
Tool wear

Thesaurusbegriffe
PERFORMANCE
PRECISION
GEOMETRY
DESIGN
SHAFT

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 154
This paper presents a study of grinding cemented carbide DK460UF (91 % WC and 9 % Co), a material used to produce cutting tools with solid cutting edges. The aim is to establish the manufacturing conditions that lead to high surface quality. A model of the main factors that influence the grinding process is presented first. Following that, grinding wheel wear and surface roughness are analysed. Grinding wheel wear is studied in experimental conditions under which small diameter gun drills were sharpened with two diamond grinding wheels of different grain sizes. Finally, the wear curve can be made. The "G ratio" is used to characterise the performance of the grinding process. Next, the experimental research examines how independent parameters, depth of cut, feed, grit, and speed influence roughness. The influence of the grinding wheel wear on roughness is also studied. The aspect of ground surfaces is examined by using a scanning electron microscope (SEM). The experimental study allowed the determination of the required grinding wheel grit (46 mu m) and the optimum processing parameters (depth of cut ap = 0.01 mm, feed = 0.005 mm/rev, cutting speed v = 55 m/s) to obtain the imposed surface roughness for cutting tool surfaces (Rz = 0.3 mu m). The maximum allowed radial wear (Delta r) of the grinding wheel is 30 mu m.
Process study on large-size silicon wafer grinding by using a small-diameter wheel

Silicon (Si) is a fundamental material in the semiconductor industry. The advancement of semiconductor devices has offered convenience and comfort to our life. In order to raise productivity and economic efficiency, the semiconductor industry keeps looking for use of larger size Si wafers. The next generation wafer is expected to be sized as large as 450 mm in diameter. Many wafering processes including lapping, grinding and polishing have been studied and grinding technology stands out as the most promising process for large-size Si wafer manufacturing. In the current in-feed grinding scheme adopted for Si wafers, the wheel diameter used is generally equal to or larger than the wafer diameter. In turn, larger diameter wheels require larger size machine tools and production lines, which lead to increase in manufacturing costs. In this paper, both experiment and kinematic analysis have been carried out to investigate the feasibility of using small diameter grinding wheels to grind large size Si wafers, mainly focusing on the effects of wheel diameter on wafer geometry and surface roughness. The results show that both wheels generated a central convex profile on the wafer and the small wheel achieved a slightly better flatness than the large wheel. The surface roughness were similar one to another for most area of the wafer except the fringe around its edge. All these experimental results were predictable by the kinematic model established in this paper. Particularly, the kinematic analysis found that the cutting path made by small wheel with diameter equaling to the wafer radius was parallel each other at the fringe around wafer edge, which directly worsened the surface roughness.
Review on Grinding Tool Wear With Regard to Sustainability

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Manufacturing processes have to become more sustainable. For grinding processes, this means that tool wear and performance need to be critically evaluated in their economic, environmental, and social impact. Tool wear affects several stakeholders. Different wear mechanisms on the grit and bond level lead to a change in tool profile and sharpness. For the user, wear changes tool costs, process stability, and maybe worker safety. Tool manufacturers need tool wear to sell replacements, whereas tool users might not like the higher waste and costs from tool wear but need tool self-sharpening.

JOURNAL OF MANUFACTURING SCIENCE AND ENGINEERING-TRANSACTIONS OF THE ASME

Engineering

WHEEL WEAR
DIAMOND
SPEED

ENGLISH

12.03.2021

157
Titel

Select of abrasive wheels while pendular grinding of parts from titanium alloy VT22 by high roughness parameters

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Abstrakt

At the present time, grinding of the titanium alloys parts is performed much less than other constructional materials that don't meet the demands of branches of engineering industries: aircraft, rocket, energy and others. This is due to the sticking of chips on the working surface of the abrasive tools from silicon carbide and electrocorundum because of the high adhesion activity between the titanium and the traditional abrasives at cutting working temperatures. To solve this problem, the high porous wheels (HPW) made of cubic boron nitride CBN30 with 100% concentration on a bond V (K27), a pore-forming KF40, varied grains: B76, B126, B151 (GOST R 53922 - 2010) - and hardness: M and O (GOST R 52587 - 2006) were used to grind titanium workpieces. Additionally the Norton wheels from green silicon carbide with a normal porosity 39C (46; 60) K8 VK and with different grain size were tested. With account for the instability of the grinding process and the random nature of roughness formation, the observation analysis was led using the statistical approaches. It allowed considering the random variables (RV), the characteristics of the one-dimensional frequency distribution which are measures of position (mean, median) and measures of scattering (standard deviation, range and quartile latitudes (QL)). In the technical applications parametric and nonparametric statistical methods were used. The first direction requires that the RV have homoscedasticity and normal distribution that is not fully secured in this study. For this reason, the nonparametric method was selected priority. Its characteristics are medians and QL. It is established that varying the process variables for each group of instruments is insignificant by measures of position. Norton wheels provide reduction of roughness height 1.6 - 1.7 times in comparison with boron nitride HPW. These are recommended for the finishing grinding stage and HPW CBN30 - the preliminary to reduce the thermal effects on workpieces. By processing stability, the Norton wheels with grain 46 rank the first, and among boron nitride HPW - CBN30 B76 100 OV K27-KF40.
The measurement and analysis of micro bonding force for electroplated CBN grinding wheels based on response surface methodology

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Abstrakt
The superabrasive (e.g. CBN or diamond) grain dislodgement occurrence on the wheel surface due to insufficient bonding force is the major failure phenomena in the grinding process with electroplated grinding tools. This failure leads to the abrupt increase of load on the immediate grains, accelerating more grain dislodgement on wheel surface. Ultimately, the aggregated grain dislodgement causes the workpiece profile accuracy degradation and catastrophic wheel sharpness loss. Therefore, the provision of sufficient and uniform micro bonding force all through the wheel surface is the critical task in electroplated superabrasive grinding wheel design. Considering the complexity in the micro bonding force enabling factors, e.g. the grain shape, dimensional size, spatial orientation, and bond layer thickness, it is vital to establish the quantitative and comprehensive relationship between these factors with the micro bonding force for optimal electroplated grinding wheel design. In this paper, an inclined micro-thread turning test is developed to measure the single grain micro bonding force. In addition, the finite element model of single CBN grain bonding force is established and validated to simulate the grain dislodgement. Finally, the response surface methodology (RSM) is applied to build the comprehensive correlation of the bonding force with its dimensional size, spatial orientation, and bond layer thickness. Therefore, the optimal bonding condition through regressed prediction model is identified to provide the quantitative basis for the electroplated CBN grinding wheels design, which indicates that the bonding force can be predicted for specific wheel manufacturing parameters and improved by related variable adjustment. (C) 2015 Published by Elsevier Ltd.
Dicing of hard and brittle materials with on-machine laser-dressed metal-bonded diamond blades

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The ultra-precision dicing of hard and brittle materials causes high wear on the abrasive tool which results in the deterioration of blade cross section as well as the decrease of diamond grain exposure. Resin-bonded diamond blades are used due to their in-process self-sharpening capability. Nevertheless, the shape of the blade cross section generated by self-sharpening is random which leads to poor accuracy when precise grooves need to be produced. Metal-bonded diamond blades feature higher tool lifetime and shape accuracy compared to resin-bonded blades, but are not capable of performing self-sharpening. In this study, the laser dressing of metal-bonded diamond blades is investigated to enable their use in the ultra-precision dicing of hard and brittle materials by continuous laser dressing. We investigated laser dressing with and without the presence of cooling water. The sharpness (grain exposure) after dressing is measured by the cutting face surface roughness. The dicing performance is evaluated by observing the dicing results in terms of cutting depth consistency and by monitoring the spindle power during dicing. Dicing blades which have been laser dressed in an environment with coolant feature less grain exposure than dicing blades which have been laser dressed in dry condition. The dicing results show an improvement in the sharpness and durability of laser-dressed dicing blades in comparison with new or conventionally dressed blades. The ability to apply and perform laser dressing on a dicing machine in an environment with coolant shows the feasibility of laser technology for continuous dressing. (C) 2013 Elsevier Inc. All rights reserved.
Experimental investigation on variation of machined residual stresses by turning and grinding of hardened AISI 1053 steel

Abstrakt
Residual stresses in machined surfaces are of great importance to the service life of a component under various loading conditions. In many cases, the material damage initiates from the weakest spot with the least compressive stress in the component surfaces. This situation leads to the consideration of residual stress moving beyond the traditional thinking of single or average values to the inclusion of variation of stress values on different measurement points. In this paper, we experimentally investigated the surface and in-depth residual stresses in hardened AISI 1053 steels machined using hard turning and surface grinding processes. Cubic boron nitride (CBN) cutting tools were used in both processes. The effects of depth of cut and number of passes were also studied. It was found that both processes produce a significant amount of compressive stress on the machined surfaces, as well as steep stress gradients underneath the surfaces. Compared with hard turning, surface grinding produces higher magnitudes of average compressive residual stresses, but it also generates up to 14 times higher scattering of residual stresses, indicated by the standard deviation of the residual stress measurements. As a result, the benefits of a highly compressive average residual stress will be offset by highly scattered individual measurements. The stochastic nature of abrasive grit distribution and orientations in grinding wheels is believed to be the contributing factor for the significant scattering. Meanwhile, for hard turning, the variation of surface and in-depth residual stresses greatly increases, up to 3.8 times, with a larger depth of cut and the use of multiple passes; however, this trend is less significant for surface grinding.
Titel
Influence of grinding parameters on the quality of high content PCBN cutting inserts

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Institution

Abstrakt
Plunge-face grinding is commonly used to finish PCBN cutting inserts. In order to reach an adequate process design, an investigation of the influence of the grinding parameters on the quality of high content PCBN inserts is carried out in this work. For this, the inserts are ground with different grinding wheels (including a variation of grain size and bonding), dressing feed rates, feed and cutting speeds and the edge chipping and flank face roughness are measured. It was found that a reduction of the abrasive grain size as well as an increase of the dressing feed rate lead to an improvement of the insert edge and surface quality. Moreover, a variation of the cutting and feed speeds has only a small influence on the PCBN insert quality. (C) 2013 Elsevier B.V. All rights reserved.

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Quelle
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Klassifikation
Engineering
Materials Science

Schlagworte des Autors
TOOL GRINDING
PCBN cutting insert
Grinding wheel wear

Thesaurusbegriffe
DIAMOND
PERFORMANCE

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 162
Powder injection moulding of metal ceramic interpenetrating phase composites

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Materials that combine metallic and ceramic properties are of interest for various applications, such as surgical instruments or grinding tools. Powder technology offers the possibility to mix metals and ceramics in form of their powders and process them to complex shapes by means of powder injection moulding. Thus, different material combinations were chosen in order to demonstrate a broad applicability of this approach. The produced composite materials were characterised regarding their densities, mechanical properties and microstructures. It could be observed that the powder injection moulded samples showed rather typical densities for specimens produced by this process, up to 98.3% relative density. The mechanical properties varied strongly mainly dependent upon the materials used in the composites. Thus, the range of mechanical properties is wide and leads to various possibilities to adjust certain properties to a desired level. In combination with the possibilities of the powder injection moulding process to produce near net shape parts cost-efficiently in large quantities, these versatile composite materials can be made accessible for various applications.
Titel
Surface roughness model in experiment of grinding engineering glass-ceramics.

Autor
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Abstrakt
The grinding experiment of mica glass-ceramics was conducted on the GM-D300-type surface grinder. The article investigated the influence of surface roughness on grinding wheel velocity, table feed speed, and grinding depth. The results indicated that surface roughness decreased with the increasing grinding wheel velocity and grinding depth in overall trend, and decreased with increasing table feed speed. Moreover, a modified surface roughness model, which introduced the maximum undeformed chip thickness, was developed based on Snoeys’ empirical formula. The modified model was in good agreement with the experimental data in most cases. The disparity between experimental data and predicted results of surface roughness was attributed to the organization of pores randomly distributed within the mica glass-ceramics. Copyright SAGE Publications. Reproduced with permission.

Veröffentlichungsjahr
2014

Quelle

Klassifikation
3LKB Spanende Bearbeitung, Zerspanen, Zerteilen
3MD Tribologie
3KXW Oberflächenegenschaften

Schlagworte des Autors
Rauigkeit
empirisches Modell
Spandicke
technische Keramik
Mica
eperimentelle Daten
Schleifscheibe
Planschleifmaschine (Metall)
Versuchsmodell
empirische Formel

Thesaurusbegriffe
nicht belegt

Sprache
Englisch

Recherchedatum
12.03.2021

Dokument Nr.
164
Effect of PMMA pore former on microstructure and mechanical properties of vitrified bond CBN grinding wheels

Vitrified bond cubic boron nitride (CBN) grinding wheels with various porosities (36.5-43.5%) were fabricated by adding polymethylmethacrylate (PMMA) and activated carbon pore former. The effects of the type and content of pore formers as well as the size of PMMA on final porosity, microstructure and mechanical properties were investigated. PMMA was confirmed to be a more appropriate pore former for vitrified bond CBN grinding wheels than activated carbon. The porous specimens prepared with PMMA demonstrated quasi-spherical pores with more uniform pore size distribution, and higher bending strength and hardness than those prepared with activated carbon. The higher content of pore former led to increased porosity of sintered specimens, resulting in a decrease in the bending strength and hardness. Furthermore, as the size of PMMA increased, the total porosity remained almost unchanged, while the bending strength and hardness decreased firstly and then increased. Observations carried out by scanning electron microscope (SEM) and optical microscope showed that the size and shape of pores produced by PMMA were related to those of the initial PMMA microspheres, so that good control of pore size and microstructure could be obtained in vitrified bond CBN grinding wheels. (C) 2012 Elsevier Ltd and Techna Group S.r.l. All rights reserved.

Veröffentlichungsjahr
2013

Quelle
CERAMICS INTERNATIONAL

Klassifikation
Materials Science

Schlagworte des Autors
POROSITY
Mechanical properties
PMMA
Microstructure

Thesaurusbegriffe
PERFORMANCE
POROSITY
CATHODES
ALUMINA

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr.
165
Although EDM is a thermal removal process, when it is applied for dressing diamond grinding wheels, usually little or no thermal damage is caused to the diamonds. In this work, a better explanation for this fact is provided. A thermo-electrical model is used to calculate the temperature distribution inside diamonds showing that even for high discharge energies small amount of graphitization occur. Here, the exceptional properties of diamond contribute to minimize thermal damages. Still, a concentration of discharges can occur around the diamonds and thus lead to thermal damages. However, this phenomenon is more evident for large diamonds. (C) 2012 CIRP.
Titel

Improving minimum quantity lubrication in CBN grinding using compressed air wheel cleaning. Verbesserung der Minimalmengenschmierung beim CBN-Schleifen durch Schleifscheibenreinigung mittels Druckluft.

Autor

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Abstrakt

The application of minimum quantity lubrication (MQL) in grinding has emerged as an alternative for reducing the abundant flow of cutting fluids, thus achieving cleaner production. Although considered an innovative technique in grinding operations, its widespread application is hindered due primarily to the high heat generation and wheel pore clogging caused by machined chips, harming the final product quality and increasing tool wear on the machine. This study sought to improve MQL use in grinding. In addition to the conventional MQL injected at the wheel/workpiece interface, a compressed air jet was used to clean the mixture of MQL oil and machined chips from clogged wheel pores. Experiments were conducted using external cylindrical plunge grinding on AISI 4340 quenched and tempered steel, and a vitrified cubic boron nitride (CBN) wheel. The cooling-lubrication methods employed were the conventional flood coolant application, MQL (without cleaning), and MQL with a cleaning jet directed at the wheel surface at different angles of incidence. The main goal of these experiments was to verify the viability of replacing the traditional abundant flow of cutting fluid with MQL and wheel cleaning. The analyses were conducted by measuring the following output variables of the process: workpiece surface roughness and roundness errors, diametrical wheel wear, acoustic emission generated by the process, and metallographic images of the ground surface and subsurface. Results show the positive effects of implementing the cleaning jet technique as a technological improvement of minimum quantity lubrication in grinding in order to reduce the usage of cutting fluids. The MQL technique with cleaning compressed air jet, for a specific angle of incidence (30°), proved to be extremely efficient in the improvement of the surface quality and accurate workpiece shape; it also reduced wheel wear when compared to the other cooling-lubrication methods that were tested (without a cleaning jet). Copyright Elsevier B.V. Reproduced with permission.

Veröffentlichungsjahr

2012

Quelle

Journal of Materials Processing Technology * Band 212 (2012) Heft 12, Seite 2559-2568 (10 Seiten, 16 Bilder, 1 Tabelle, 30 Quellen)

Klassifikation

3LKB Spanende Bearbeitung, Zerspanen, Zerteilen
3MD Tribologie
3KEB Staehle, Stahlguss
3PH Trennen fester, flüssiger, gasförmiger Stoffe, disperser Stoffsysteme
Schlagworte des Autors

gehaerteter Stahl
Schleifen mit Scheibe
CBN-Schleifscheibe
Oberflaechenreinigung
Druckluftstrahlen
Minimalmengenkuehlschmierung
Materialeinsparung
Kuehlschmierstoff
Spaenebeseitigung
Werkzeugverschleiss
praktische Untersuchung
gebundenes Schleifkorn
Methodenvergleich
Tribotechnik
Verfahrenseignung
Rauigkeit
Schallemission
metallographische Pruefung
Einfallswinkel
Luftstrahl
Oberflaecheneigenschaft
Formgenauigkeit
Verschleissminderung
Chrom-Nickel-Molybdaen-Stahl

Thesaurusbegriffe

Schleifscheibenverschleiss
Reinigen mit Druckluftstrahlen

Sprache

Englisch

Recherchedatum

12.03.2021

Dokument Nr. 167
Experimental and numerical investigations on powder pressing with superimposed oscillations of two materials

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The pressing process is of special importance for the production chain of powder metallurgically produced components because in this production step the density distribution and thus the specific characteristics are set significantly. Especially the inevitable friction between the forming tools and the powder body leads to density gradients, which in turn cause sintering distortions and thus inhomogeneous material properties within the component. Therefore, the aim of the presented work was the systematic investigation on powder pressing with superimposed oscillations for the production of powder-metallurgically produced components in order to reduce friction-related density gradients. Subjects of the investigations were an aluminum powder (Alumix 13, ECKA) and a mixture of a abrasives and bond (Comet grinding wheels) as it is used for the production of ceramic bond grinding wheels. The results allow different material-related conclusions regarding the positive effects of superimposed oscillations on the pressing process. Thus, the existence of a favorable oscillation frequency of about 60 Hz for the investigated abrasive/bond mixture could be proven. Above that, experimental and numerical investigations showed that, with an adequate oscillation frequency, density distributions can be achieved which otherwise can only be observed for the significantly more complex double action pressing.

2011

MATERIALWISSENSCHAFT UND WERKSTOFFTECHNIK

Materials Science

POWDER TECHNIQUES
Friction
Density
Superimposed oscillations
Finite Element Analysis

nicht belegt

12.03.2021

168
Titel
Vibration analysis of rail grinding using a twin-wheel grinder

Autor
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Abstrakt
Grinding is the final process of machining a rail. Conventionally, the rail's surfaces are ground by a single-wheeled grinder. The vibrations caused by the grinding process can greatly influence the final surface roughness and dimensional accuracy of the rail. This research investigates performance achieved by using two grinding wheels simultaneously and symmetrically on two opposite surfaces of a rail. In practical terms, the feed force from the two grinding wheels cannot be aligned perfectly, and the imbalance and/or imperfect roundness of the grinding wheels will certainly result in vibrations during the grinding process. This study applies an impedance method to determine rail vibration and the grinding instability, such as chatter caused by feed force misalignment and grinding wheel imbalance. When compared to conventional single-wheel grinding, the results indicate twin-wheel grinding reduces rail vibration, leading to low incidence of grinding chatter and better grinding performance. However, feed force misalignment between the two grinding wheels can lead to increased chatter, and both resonance and chatter may occur at lower grinding speeds as feed force misalignment increases. Results also show that feed force misalignment has a greater effect on rail vibration and chatter than imbalance asynchronization between the two grinding wheels. (C) 2010 Elsevier Ltd. All rights reserved.

Veröffentlichungsjahr
2011

Quelle
JOURNAL OF SOUND AND VIBRATION

Klassifikation
Acoustics
Engineering
Mechanics

Schlagworte des Autors
nicht belegt

Thesaurusbegriffe
CHATTER

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr.
169
An Investigation into the Influences of Grain Size and Grinding Parameters on Surface Roughness and Grinding Forces when Grinding

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Gazi Univ, Tech Educ Fac, Ankara, Turkey.

This study was carried out to investigate the effects of grain size on workpiece surface roughness and grinding forces when surface grinding AISI 1050 steel. A previously designed and constructed dynamometer was used to measure and record the forces developed during grinding. Grinding tests were carried out using different grinding wheels of different grains. Ground still ace roughness measurements were also carried out. The results showed that grain size significantly affected the grinding forces and surface roughness values. Increasing grain size and depth of cut increased the grinding forces and surface roughness values. For different grain sizes, depth of cuts of 0.01 and 0.02 mm did not result in any significant variations in the grinding forces but further increase in depth of cut led to variations of up to 50% in grinding forces. (C) 2010 Journal of Mechanical Engineering. All rights reserved.

STROJNISKI VESTNIK-JOURNAL OF MECHANICAL ENGINEERING

Engineering

SURFACE GRINDING
grinding forces
surface roughness
grinding wheel
grain size

MECHANICS

ENGLISH

12.03.2021
This paper addresses the effects of bonds and grains of abrasive tools on the edge aspect of ground glass surface. Diamond grains and silicon carbide (SiC) grains combined with two bond types, i.e., resin and metal, were considered for this study. The surface edge characteristics were characterized using scanning electron microscope (SEM) and interferometer observations. In particular, the spectrum of arithmetic mean was investigated for distinguishing the different scales of analysis. Experimental results showed that the grinding forces vary sensitively with bond type and wheel velocity. Using diamond grains' wheel, it was found that toughness level obtained with metallic bond is lower than that obtained with resin bond. However, using a resin-bonded wheel, two mechanisms of material removal were revealed according to grains' type. (i) A partial ductile regime, i.e., ductile streaks and brittle fracture, obtained with diamond grains, and (ii) a fully ductile regime obtained with SiC grains. Thus, it was found that ground surface obtained using SiC grains' wheel has a better roughness than that obtained using diamond grains wheel. Besides, SiC grains seem to lead to more marked streaks and form defects. (C) 2009 Elsevier B.V. All rights reserved.
Wear analysis of electrolytically dressed wheels for finishing substrate materials

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Geiss A
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Sperber P


Finishing of silicon wafers is a billion dollar global business. The present process chain consists of several processes, which lead to long production times and increase the cost of the finished materials. In the recent years, several processes have been experimented as an alternate process for finishing substrate wafers with stringent specifications. However, there are no successful alternate processes, which have been adopted by the wafer processing industries. The electrolytic in-process dressing (ELID) grinding is one of the processes that has already been experimented on silicon wafers for producing mirror surface finish. However, the flatness achieved from the ELID grinding is not reported. The main influence on the flatness of the wafers during ELID grinding may be due to the wear of the grinding wheels. The wear mechanism of electrolytically dressed wheels has not been fully understood and reported. The main objective of this study is to report the wear behaviors of the wheels during thinning and fine finishing processes. (C) 2009 Elsevier Ltd. All rights reserved.
Titel
Influence of material structure on creep feed grinding of high-speed steels. Einfluss der Werkstoffstruktur auf das Tiefschleifen von Schnellarbeitsstaehlen.

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Abstrakt
During the last 20 years, grinding technology has progressed a lot regarding material removal rates, efficiency, quality and new fields of application. Nevertheless, only few research results have been presented about grinding of high-speed steels. At WZL at RWTH Aachen University comprehensive analyses of the grinding behaviour of different new high-speed steels have been conducted. The examination included the systematic variation of alloys and structures in an industry-related creep feed grinding operation with resin bonded CBN grinding wheels. It was found that higher matrix hardness leads to slightly higher workpiece roughness and grinding forces. For rough grinding operations, powder metallurgy steel has a clear advantage of smaller grinding forces. This can be explained by its finer grain size and more homogeneous grain distribution compared to conventional steel. Lower carbide concentration resulted in decreasing workpiece roughness, grinding forces and wheel wear. However, the maximum material removal rates which had no grinding burn did not depend on the HSS type ground in these examinations. For this process setup it occurred that appropriate process design is still more relevant for the maximum material removal rate than steel composition. However, choice of high-speed steel material still can be dominated by the further tool application rather than grinding process.

Veröffentlichungsjahr
2009

Quelle

Klassifikation
3KEB Staehle, Stahlguss
3KWG Kristallstruktur, Werkstoffgefuege und -textur
3LKB Spanende Bearbeitung, Zerspanen, Zerteilen

Schlagworte des Autors
Schnellarbeitsstahl
chemische Zusammensetzung
Spanbarkeit
Schleifen
Tiefschleifen
Werkstoffpruefung
Schleifdruck
Rauigkeit
Verschleiss
Haerte
Werkstoffgefuege
Carbid
Seigerung
Konzentrationseinfluss
Chrom-Molybdenaen-Vanadium-Wolfram-Stahl

Thesaurusbegriffe
nicht belegt
Titel
Keramik schlägt Zirkon um Längen. Abtragsleistung und Stanzeit deutlich verbessert.

Autor
nicht belegt

Institution
nicht belegt

Abstrakt
Submerged Arc Welding with Mixed into the Flux Materials Aiming to Obtain Hardened after Tempering Layer

Titel

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Kavaliauskiene L

Institution

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Abstrakt

The layers obtained by overlay welding of CT3 steel with CB 08 wire under AMS1 flux mixed with graphite, chromium, molybdenum, WC-8% Co, Fe - 70% Mn, modifiers SiCaBa and SBS powder are investigated. Milled glass, unused grinding wheels SiC and B4C and hard metal T15K6 powder was used for overlay welding instead of a flux. Effect of overlay welding composition on the layers microstructure and hardness as well as hardness change due to tempering at 500 degrees C-650 degrees C temperatures are investigated. Abrasive wear tests were carried out and they showed that wear resistance of surfacing layers was higher than that of hardened tool steels. Use of secondary raw materials for overlay welding allows to obtain hard enough and high quality layers.

Veröffentlichungsjahr

2009

Quelle

MATERIALS SCIENCE-MEDZIAGOTYRA

Klassifikation

Materials Science

Schlagworte des Autors

POWDER
overlay welding
hardness
tempering
wear

Thesaurusbegriffe

ABRASIVE WEAR BEHAVIOR
MICROSTRUCTURE
ADDITIONS

Sprache

ENGLISH

Recherchedatum

12.03.2021

Dokument Nr.

175
Dressing process model for vitrified bonded grinding wheels

LINKE B

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A holistic dressing process model for vitrified bonded grinding wheels was designed. It regards the dressing process as a tribological system subjected to a complex load collective. The intensive analysis of the input variables and their impact on the system function led to new knowledge about the acting mechanisms. The model enables a qualitative prognosis of the grinding wheel topography, the dressing forces and the thermal dressing process load. (c) 2008 CIRP.

2008

CIRP ANNALS-MANUFACTURING TECHNOLOGY

Engineering

GRINDING WHEEL
dressing
process model

176
Titel
Post-treatment of thermal spray coatings on magnesium

Autor
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Wielage B
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Grund T
Student M
Chervinska N

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Abstrakt
Magnesium alloys have a beneficial combination of high strength to weight ratio, good machinability and high recycling potential. Despite this, the application of magnesium still is behind that of other constructive materials mainly due to low wear and corrosion resistance. For more demanding applications, a large amount of surface treatment methods are developed to overcome this problem. Thermal spraying is an efficient and flexible method of coating deposition and is widely used for protection of different materials against corrosion and wear. Nevertheless, the bonding of thermal spray coatings on magnesium alloys is not sufficient, so the following post-treatment processes are needed. One of such possibilities is high energy beam treatment of thermally sprayed coatings. During the heat treatment of magnesium substrates with coating the remelting of coating and a thin surface layer of substrate occurs. Depending on the combination of applied coating system and treatment method, different processes can be realised in modified layers: the alloying of magnesium substrate with other elements to improve corrosion properties, redistribution of hard particles from composite coating and new phases formation during the processing to improve the wear resistance of magnesium alloys. In the present work some examples concerning the laser and electron beam treatment of aluminium based composite coatings as well as infra red irradiation of zinc based coatings are described. Coatings are deposited on magnesium substrates (AM20, AZ31, AZ91) by are spraying with Zn, ZnAl4 and ZnAl15 solid wires and cored wires in aluminium core with powder filling containing different hard particles, such as boron, silicon and tungsten carbide or titanium oxide. Remelting of thermal spray coatings is carried out by means of continuous irradiation of CO2-laser in nitrogen or argon atmosphere, electron beam in vacuum and focused tungsten halogen lamp line heater in atmosphere. Microstructure of sprayed coatings as well as that of modified surface layers is investigated by metallographic methods. Corrosion properties are estimated by electrochemical measurements. Abrasion wear resistance of the modified layers is determined by scratch test, corundum grinding disk test and Rubber wheel test. It is shown that all methods applied for processing of thermal spray coatings lead to formation of modified surface layers in magnesium substrate with improved wear and corrosion properties. Different mechanisms of microstructure formation such as redistribution of chemical composition of composite coating components, partial remelting of hard phase particles, and new phases formation are discussed. Electrochemical behaviour of modified surface layers is mostly improved due to alloying, homogenization of element distribution and strong decrease of as-sprayed coating porosity. Abrasion wear resistance of processed magnesium substrates strongly depends on the microstructure and usually is 5 to 20 times higher compared with base material. (C) 2008 Elsevier B.V. All rights reserved.

Veröffentlichungsjahr
2008

Quelle
SURFACE & COATINGS TECHNOLOGY

Klassifikation
Materials Science
Physics
Schlagworte des Autors
- MAGNESIUM ALLOYS
- thermally sprayed coatings
- post treatment
- high energy beams
- corrosion resistance
- abrasive wear resistance

Thesaurusbegriffe
- CORROSION BEHAVIOR
- ALUMINUM
- ALLOYS
- INJECTION

Sprache
- ENGLISH

Recherchedatum
- 12.03.2021

Dokument Nr.
- 177
Title
Power and wheel wear for grinding nickel alloy with plated CBN wheels

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Abstract
Electroplated CBN grinding wheels are manufactured with a single layer of abrasive grains. The grinding performance of these plated wheels changes significantly as the wheel wears down. The present investigation was undertaken to understand the transient grinding behavior with electroplated CBN wheels in order to provide a logical basis for process control. In this paper, particular attention is directed to the effect of wheel wear and operating parameters on grinding of a nickel alloy. Wheels were worn to various stages and then used to perform grinding tests under various grinding conditions to measure grinding forces and power and to produce ground specimens. Based on models for grinding with conventional aluminum oxide wheels, a power model for grinding of a nickel alloy with plated CBN wheels was established and validated. Microscopic observations of the ground specimens reveal that thermal damage in the form of a White Etch Layer (WEL) appears only when grinding with a worn wheel under conditions that lead to high temperatures.

Veröffentlichungsjahr
2007

Quelle
CIRP ANNALS - MANUFACTURING TECHNOLOGY

Klassifikation
Engineering

Schlagworte des Autors
GRINDING
CBN
nickel alloy

Thesaurusbegriffe
nicht belegt

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 178
Titel
Experimental investigation of burr formation in the surface grinding of tool steel

Autor
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Braun O

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Abstrakt
Increasing industrial requirements concerning the precision of edge geometry lead to the investigation of burr formation, particularly in finishing operations such as grinding. In the present paper, a fundamental investigation of burr formation in the flat surface grinding of tempered tool steel (90MnCrV8) is presented. Conventional and superabrasive grinding wheels with different grain sizes and materials are used under varying cutting conditions. In addition, a 'hybrid grinding wheel', which essentially is the wheel hub of a superabrasive wheel with an aluminium oxide abrasive layer, is used in order to isolate the influence of the abrasive material. The geometry of the generated exit burrs at the workpiece edge is investigated. The geometrical burr parameters are measured using optical microscopy. Furthermore, measured grinding forces and temperatures are correlated with the burr parameters. In addition, the microstructure of the burr material is analysed by metallographic sections. As a result of the experimental investigations, an approach to describing burr formation mechanisms in grinding as well as the influences of grinding wheel and cutting parameters on burr shape and size is obtained.

Veröffentlichungsjahr
2006

Quelle
PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART B-JOURNAL OF ENGINEERING MANUFACTURE

Klassifikation
Engineering

Schlagworte des Autors
ABRASIVE PROCESSES
grinding
burr formation

Thesaurusbegriffe
nicht belegt

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr.
179
Titel

Improved grindability and gold liberation by microwave pretreatment of a free-milling gold ore

Autor

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Khan A.U.
Pickles C.A.
Yen W.T.

Institution
	nicht belegt

Abstrakt

The gravity concentration of gold is very efficient if the metal is fully liberated and the particle size of the gold is relatively coarse. Liberation is usually achieved by comminution, but due to the association of the gold with the other minerals in the ore, overgrinding occurs in conventional comminution circuits and slime generation leads to inefficient recovery. The liberation of minerals can be improved by adding grinding aids, which modify the mechanical properties of the ore and allow breakage at lower stress levels. In this research, microwave pretreatment was used to augment the grinding of a free-milling gold ore containing quartz, silicates and iron oxides. Under microwave irradiation, selective heating of the different mineral components resulted in thermal stresses that caused cracking. These intergranular and transgranular fractures were confirmed by scanning electron microscopy. After microwave processing, the grindability of the ore was improved and the crushing strength and the Bond Work Index were reduced by 31.2% and 18.5%, respectively. In addition to the enhanced grindability, gold was released from the matrix of the host minerals at a coarser size, resulting in a significant increase in free gold recovery by gravity concentration. For a gold ore with a head grade of 6.4 g t⁻¹, the gold recovery improved from about 28% to 40% after microwave pretreatment.

Veröffentlichungsjahr

2005

Quelle

Mineral Processing and Extractive Metallurgy

Klassifikation
	nicht belegt

Schlagworte des Autors
	nicht belegt

Thesaurusbegriffe
	nicht belegt

Sprache
	nicht belegt

Recherchedatum

12.03.2021

Dokument Nr.

180
Surfaces of calcium fluoride single crystals ground with an ultra-precision surface grinder.

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YOSHIDA, K.

Chubu University, Kasugai, JP
Osaka Institute of Technology, JP

An ultra-precision surface grinder having an extremely-low thermal expansion spindle was used to finish high purity CaF$_2$ single crystal surfaces. The CaF$_2$ single crystals for next-generation optical lithography were fabricated with surfaces corresponding to the (001), (111), and (110) crystalline planes. The grinding process utilized an ultra-precision surface grinder and was optimized for resin-bonded SD3000-75-B diamond wheels. The following conclusions were drawn from the results of this study: 1) The ultra-precision grinding produces micro-crack-free surfaces on any crystalline plane when using a slow feed rate and small grain sizes of the diamonds in the grinding wheels. The grinding mode depends on the maximum grain size of the diamonds in the wheel. 2) Surface roughness in ultra-precision grinding depends on the average grain size in a diamond wheel, feed rate crystalline plane, and grinding direction. A surface roughness of less than 1 nm Ra can be obtained on any crystalline CaF$_2$ plane. 3) The subsurface damage layer thickness is 0.3 micrometer on a (111) surface that was ultra-precision ground with an SD3000-75-B wheel. 4) The laser-induced damage threshold on an ultra-precision ground surface depends on the surface roughness and is higher than that on an optically polished surface.


3LKB Spanende Bearbeitung, Zerspanen, Zerteilen
3FF Herstellungstechnologien fuer elektronische Bauelemente und Schaltungen
3KEM Nichteisenmetalle (auch Sondermetalle), -legierungen, -gusswerkstoffe
3FE Herstellung von Halbleiterwerkstoffen

Schlagworte des Autors
Flachschleifen
Feinstbearbeitung
Spindel
thermische Eigenschaft
Calciumfluorid
Einkristall
Photolithographie
Diamantschleifscheibe
Anisotropie
Geschwindigkeit
Mikroriss
Oberflaechenrauigkeit
Subgefeuge
Laserbestrahlung
Schaden

Thesaurusbegriffe
nicht belegt
Synergistic effects of thermo-chemical treatment and super abrasive grinding in gears' manufacturing

GAWRONSKI Z
Kruszynski B
Kula P


It was specified that the combined optimisation of both surface hardening processes by means of vacuum carburising and final grinding with use of modern grinding wheels made of cubic boron nitride, led to synergistic generation of favourable compressive residual stresses within the surface layer. This is the advantageous spectrum of residual stresses from the bending and contact fatigue resistance of the gear wheels point of view. The methodology adopted and examples of residual stresses distribution by means of FEM method modelling are presented in this paper. Also, the original special equipment that allows the experimental determination of contact fatigue resistance of gear wheels and their bending fatigue strength is described. (C) 2004 Elsevier B.V. All Rights reserved.

Veröffentlichungsjahr
2005

Quelle
JOURNAL OF MATERIALS PROCESSING TECHNOLOGY

Klassifikation
Engineering
Materials Science

Schlagworte des Autors
SYNERGY
carburising
CBN grinding
surface integrity

Thesaurusbegriffe
RESIDUAL-STRESSES

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr.
182
A general algorithm for profiling and dressing grinding wheels when using a grinding spindle on a CNC lathe

Remarkable progress is being made in the technology for grinding complicated geometrical parts. Today, some factories are considering adding a grinding spindle to a turning lathe to save buying an additional expensive new grinding machine. The grinding spindle will be interchangeable with a turning boring bar and it will need two types of software. First is a program and subroutine to control the machine movement during the grinding profile of the work-piece. Second a program and a subroutine are needed to pro. le the new grinding wheels according to the grinding profiles of the work-piece, as well as dressing the grinding wheels after usage. In the case of a very small depth of cut, a long program will be required. Each different shape of grinding wheel will require different software. There are no detailed descriptions for this problem in the literature or machine manuals. This paper presents a general algorithm to make the profiling and dressing programs for grinding wheels easier. The programmer will use this algorithm for creating a subroutine suitable for the machine dressing system. This algorithm can be used on grinding machines as well as on an additional grinding spindle on a hollow spindle lathe. This subroutine will be used for profiling and dressing the most common shape of grinding wheels. The programmer will then only need to fill in the parameters which describe the contour of the grinding wheels. This algorithm has been applied on a hollow spindle lathe equipped with a numerical Sinumeric 840C control. Several grinding wheels have been pro. ed and dressed using the proposed approaches, and satisfactory results were obtained.
Titel
Characterization of vitreous bonded grinding wheels for CNC crushing

Autor
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Institution
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Abstrakt
Plunge grinding operations carried out by means of profiled CBN or diamond wheels make high demands on the tool profile generation process. The use of conventional plunge dressing processes based on the reproduction of the dressing roller profile into the grinding wheel leads to a considerable wear of the dressing tool. The innovative dressing process CNC crushing is particularly suitable for profiling and sharpening superhard grinding wheels. The working principle is based on a punctual contact between the grinding tool and the dressing tool. The shape of the dressing roller is independent of the grinding wheel profile which is generated by the CNC-system of the machine tool through a combined movement of its axes, making the process significantly flexible. By means of a closed loop system the dressing speed can be continuously controlled so that no relative speed occurs between the tool and the grinding wheel. This contributes to a reduction of the dressing roller wear. In order to be dressable through form crushing, the grinding wheel bonding system has to be sufficiently brittle, so that grits and bond material can be pulled out by the dressing normal forces, which are concentrated in the contact point. This contribution describes a test method aimed at characterizing the grinding layer of a wheel in regard to its mechanical properties. The method, based on the execution of penetration investigations by dint of a single grain diamond tool, allows determining elasticity and brittleness of a grinding layer and delivers a qualitative assessment of its suitability to be dressed through CNC crushing, as analogy investigations have shown.

Veröffentlichungsjahr
2004

Quelle
ADVANCES IN ABRASIVE TECHNOLOGY VI

Klassifikation
Materials Science

Schlagworte des Autors
DRESSING
CNC crushing
grinding
diamond grinding wheels

Thesaurusbegriffe
nicht belegt

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 184
Fluid performance study for groove grinding a nickel-based superalloy using electroplated cubic boron nitride (CBN) grinding wheels

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Misiolek WZ
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Lehigh Univ, Dept Mat Sci & Engn, Bethlehem, PA 18015 USA.
Lehigh Univ, Dept Ind & Syst Engn, Bethlehem, PA 18015 USA.

The performance of three water-based grinding fluids was analyzed and compared to a neat oil tested under the same process conditions. Light optical and scanning electron microscopy observations show the mechanism of metal deposition that leads to CBN wheel failure for water-based fluids. To improve the performance of the water-based fluids, a new nozzle layout is proposed that would prevent metal deposition on the CBN wheels. The proposed solution is not chemical, but mechanical in nature and the presented setting should be optimized in the future to assure satisfactory performance of the CBN wheels with water-based fluids.

2004

JOURNAL OF MANUFACTURING SCIENCE AND ENGINEERING-TRANSACTIONS OF THE ASME

Engineering

FLOW
ZONE

ENGLISH

12.03.2021
Performance and wear behaviour of diamond fibre grinding wheels when grinding glass

Diamond coated fibres have been produced by a hot filament CVD technique, where the surface of the fibres has a faceted structure making them suitable for use as an abrasive medium. Grinding trials to determine the performance of a metal bonded diamond fibre grinding wheel have been carried out using a 'state of the art' machining centre developed for the high precision ductile regime grinding of optics. Further work has been undertaken using a single fibre placed radially in a titanium disc to assess wear. Ductile ground surfaces were produced in BK7 glass with a surface roughness figure of 70 nm Ra, and less than 2 μm sub-surface damage. The wear behaviour of the single fibre mounted in a disc wheel was monitored. Measurements showed that the initially sharp leading edge broke down to form a chamfered wear face, the profile produced by the fibre remaining similar. Diamond fibre grinding wheels have been shown to be capable of ductile grinding. These initial trials suggest that diamond fibres have the potential for longer wheel life, when grinding in the ductile region, compared with existing resin bond wheels.
Titel
Precision machining of calcium fluoride. Feinbearbeitung von Calciumfluoriden.

Autor
BRUNNER, E.

Institution
Staehli, Pieterlen/Biel, CH

Abstrakt
Gestiegene Anforderungen an die Leistungsfähigkeit von Linsen für Hochleistungslaseroptiken im Laserwellenlängenbereich bis 157 nm, wie sie zum Beispiel in der optischen Mikrolithographie und zur Herstellung von Speichermedien mit hoher Speicherdichte benutzt werden, führen zur Ablehnung der Quarzglaslinsen durch Linsen aus Calciumfluorid CaF₂. Calciumfluorid-Linsen besitzen eine höhere Lichtdurchlässigkeit und Beständigkeit gegenüber Hochenergie-Laserstrahlen, Spannungsfreiheit und einen homogenen Brechungsindex. Allerdings stellen Calciumfluorid-Linsen auch sehr hohe Anforderungen an ihre Fertigungsverfahren, insbesondere an die Oberflächenbeschaffenheit: CaF₂ ist mit einer Mohs-Härte von 4.0 deutlich weicher als Quarzglas und damit auch anfällig gegen kleinste Polierfehler, außerdem ist der thermische Ausdehnungskoeffizient mit 18,85 x 10⁻⁶/K sehr viel höher (0,56 x 10⁻⁶/K bei Quarzglas), was konstante Bearbeitungstemperaturen notwendig macht, und als kristalliner Werkstoff sind die mechanischen Eigenschaften von (111)-CaF₂ und damit auch die Abtragrate abhängig von der Kristallorientierung und schwanken im Verlauf des Polierens. Der Poliervorgang muss rein mechanisch erfolgen, was die Verwendung chemisch wirksamer Poliermittel wie Ceroxide ausschließt. Bei der A. W. Staehli AG wurde ein Polierkonzept entwickelt, das auf einem dreistufigen Polierverfahren der durch Diamantfräsen hergestellten Rohlinge beruht. Als Poliermittel dient eine Diamantsuspension (Diamantpartikelkornung von 5 bis 1 Mikrometer) auf einer Polierfolie, die auf einer absolut flachen Polierscheibe mit 1270 mm Durchmesser aufgebracht ist (Umdrehungsgeschwindigkeit 20 U/min). Die Poliermaschine FLM-1270-FP erlaubt eine kontrollierte und gleichmäßige Zufuhrung der Diamantsuspension und ist mit einer Polierscheibenabrichtung ausgerüstet, die die Verunreinigung der Polierfolie durch abgetragenes Linsenmaterial und Diamantsuspension verhindert. Durch das Polierverfahren werden Oberflächenqualitäten erreicht, die den Anforderungen der Abnehmer entsprechen: Ra = 0,001 Mikrometer (14 Angstrom), mittlere Rauhigkeit RMS = 0,002 Mikrometer (20 Angstrom) und Rauheitshöhe PV (Peak-to-Valley) = 0,033 Mikrometer (334 Angstrom).

Veröffentlichungsjahr
2004

Quelle
Industrial Diamond Review * Band 64 (2004) Heft 1, Seite 37,39 (2 Seiten, 4 Bilder, 1 Quelle)

Klassifikation
3LKB Spanende Bearbeitung, Zerspanen, Zerteilen
3QB Mikrosystemtechnik
3KGB Minerale, natürliche und synthetische Kristalle, Gesteine
3KXO Optische Werkstoffeigenschaften
Schlagworte des Autors

- Optikpoliermaschine
- optische Linse
- mechanisches Polieren
- Feinstbearbeitung
- Calciumfluorid
- Transmissionsvermögen
- Brechungsindex
- Laserglas
- Laserwerkstoff
- Laserstabilität
- Diamantwerkzeug
- Poliermittel
- Polierscheibe
- polierte Oberfläche
- Polierteller
- Mohs-Härte
- thermischer Ausdehnungskoeffizient
- Schleifscheibenabrichtung
- Verfahrensparameter
- Rauigkeit
- suspendierter Stoff
- Korngröße
- Laseroptik

Thesaurusbegriffe

- Polierfolie

Sprache

- Englisch

Recherchedatum

- 12.03.2021

Dokument Nr.

- 187
Reduction characteristics of iodate ion on copper: Application to copper chemical mechanical polishing.

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Potentiodynamic and potentiostatic polarization, and the rotating disk electrode technique were used to study the reduction characteristics of iodate (IO$_3^-$) ion on copper (Cu). Depending on the relative concentrations of (IO$_3^-$) and H$^+$. two pH regimes were observed. The cathodic current in the first regime (pH > 3) was controlled by H$^+$ diffusion from the solution to the metal surface. In the second regime (pH < 3 and up to 10-2 M (IO$_3^-$) concentration) the cathodic current was found to be under mixed control, involving reaction control via the electrochemical reduction of (IO$_3^-$) and transport control via the diffusion of I$_2$ (aq). It was concluded that (IO$_3^-$) was an effective oxidant for Cu chemical mechanical polishing (CMP) with strongly acidic (pH < 3) slurries but it was not convenient reagent as an oxidant for Cu CMP with weakly acidic (pH > 3) slurries.


3LKG Chemisches und elektrochemisches Abtragen
3KEM Nichteisenmetalle (auch Sondermetalle), -legierungen, -gusswerkstoffe
3PL Chemische Verfahrenstechnik, chemische Reaktionstechnik

Diffusion
Reaktionskinetik
elektrochemische Elektrode
Anion
Kathode
Katalyse
pH-Einfluss
Säuregehalt
Schwefelsäure
Elektrolyt
Iodat
Kupfer
chemisch-mechanisches Polieren

Thesaurusbegriffe
Diffusion in Festkörpern
elektrochemisches Messen
Reduktionscharakteristik

Sprache
Englisch

Recherchedatum
12.03.2021

Dokument Nr. 188
Titel
A new generation of high-porous vitrified cBN wheels. Eine neue Generation hoch poröser keramischer CBN-Schleifscheiben.

Autor
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Institution
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Abstrakt
Traditionelle keramische CBN-Schleifscheiben mit hoher Dichte, Haarte und geringer Porengroesse (0,01 bis 0,02 mm) leiden unter erhöhter Klebneigung der unter hohem Druck stehenden Späne an der Schleifscheibe, schlechter Versorgung der Schnittflaeche mit Schneidflüssigkeit, Einbrandneigung und Tendenz zur Rissbildung an der Werkstueckoberflaeche. Abhilfe schafft eine Neuentwicklung der Ilyich Abrasive Company, St. Petersburg, Russland: AEROBOR-CBN-Schleifscheiben mit regulierbarer Porengroesse bis zum 6-fachen der mittleren CBN-Koernung, die einen verbesserten Transport der Schneidflüssigkeit und eine verbesserte Lüftung der Schnittkontaktfläche bewirken. Die relative Kontaktaenge liegt mit 0,008 bis 0,03 deutlich unter der traditioneller CBN-Schleifscheiben (0,7 bis 0,11), wahrend die mittlere Ganghoehe zwischen Kornspitzen 3-fach bis 4-fach hoher ist, was zu einer kleineren Reibungsläche und groesserem Zwischenkornabstand fuhrt. AEROBOR-CBN-Schleifscheiben zeigen in Anwendungsversuchen zum Oberflächenchleifen von Nickel-Chrom-Molybdaen-Legierungen (CrNi73MoBT) mit 73 % Ni uberelegte Leistungen auch bei hoheren Schnittiefen (bis 0,2 mm) bei stabilier Raugheit der geschliffenen Flächen (0,45 bis 0,7 Mikrometer) und hoher Oberflächen-Mikrohaarte (4800 bis 5050 n/mm2). Weitere erfolgreiche Anwendungen der AEROBOR-Schleifscheiben sind das Formschleifen von Kugelumlaufspindelantrieben und Schraubgetrieben aus hochlegierten Staehlen (20CrNi3A, X40CrMoVNi, Ni45MoBT) und das Trockenschleifen von Schneidwerkzeugen aus Schnellarbeitsstaehlen (HSS R18, HSS R655V3), wo eine wesentliche Verkurzung der Bearbeitungsdauer gegenüber traditionellen keramischen CBN-Schleifscheiben (30 bis 40 %) und gegenüber Aluminiumoxid-Schleifscheiben (90 %) sowie Verringerung der Schleiffscheibenabrichtungen (um 60 %) zu verzeichnen sind. AEROBOR-CBN-Schleifscheiben stellen somit eine hervorragende Alternative dar auch fuer die Bearbeitung von Staehlen und Legierungen mit hoher Plastizitaet und niedriger Haerte.

Veröffentlichungsjahr
2003

Quelle
Industrial Diamond Review * Band 63 (2003) Heft 4, Seite 53,55-56 (3 Seiten, 7 Bilder, 4 Tabellen)

Klassifikation
3LKB Spanende Bearbeitung, Zerspanen, Zerteilen
3KER Superlegierungen
3KEB Staehle, Stahlguss
Schlagworte des Autors

CBN-Schleifscheibe
Porositaet
Formschleifen
Anwendungsgebiet
Porengroesse
Trockenbearbeitung
Reibungsverhalten
Nickelsuperlegierung
Nickelmolybdaenstahl
hitzebestaendige Legierung
Schnitttiefe
Schleifgeschwindigkeit
Flachscheiben
Schleifeigenschaft
Rauigkeit
Mikrohaerte
hochlegierter Stahl
Chrom-Nickel-Molybdaen-Vanadium-Stahl
Schraubgetriebe
Bearbeitungszeit
Schleifscheibenabrichtung
Oberflaechenfehler
Produktivitaet
Schnellarbeitsstahl
Chrom-Nickel-Stahl
Nickel-Molybdaen-Stahl

Thesaurusbegriffe

porosee CBN-Schleifscheibe

Sprache

Englisch

Recherchedatum

12.03.2021

Dokument Nr. 189
ELID-grinding of neutron Fresnel lens with forming wheel. ELID-Schleifen von Fesnel-Neutronen-Linsen mit formgebender Scheibe.

Autor
LIN, W.
OHMORI, H.
GUO, J.
MORIYASU, S.
IWAKI, M.

Institution
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Abstrakt
The new design of a fresnel lens refracting a cold-neutron beam is proposed in this paper. The authors applied an ultraprecision electrolytic in-process dressing (ELID) micro-grinding technique using cast-iron bonded diamond wheels whose edges have been sharpened by electrical and mechanical processes to fabricate the element, and successfully obtained the required element with a sharp and smooth V-faced fresnel structure using MgF2 glass. And relationship of the form accuracy of fabricated Fresnel lens and the change of grinding wheel shape had discussed.

Veröffentlichungsjahr
2003

Quelle

Klassifikation
3LKB Spanende Bearbeitung, Zerspanen, Zerteilen
3IDX Teilchenspektrometrie und -mikroskopie
3QB Mikrosystemtechnik

Schlagworte des Autors
elektrochemisches Schleifen
Fresnel-Linse
Neutronenstrahl
Diamantschleifscheibe
Gusseisen
Magnesiumfluorid
Formgebungsfehler
Profilschleifen

Thesaurusbegriffe
nicht belegt

Sprache
Englisch

Recherchedatum
12.03.2021

Dokument Nr. 190
Diamond-fluoroplastic composites for abrasive tools

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Kirillin AD
Chersky IN

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Composite materials based on polytetrafluoroethylene (PTFE) and natural technical diamond powders from Yakutia diamond deposits are developed. It is shown that the compositions based oil PTFE and a technical diamond powder at a content of lip to 60 wt.%, due to their good physicomechanical characteristics, low friction coefficient, and good wetting of diamond particles by polymer, make is possible to create abrasive tools for polishing and grinding hard metals and semiprecious and precious stones with high serviceability and operational life combined with a considerable increase in the quality of treated surfaces and operational stability of the tools. It is found that PTFE, being a more elastic and softer matrix than the traditional ones, exhibits a self-sharpening effect of diamond grains upon grinding hard surfaces, when the grains go deep into the elastic matrix, the matrix wears out, and the working part of the tool becomes enriched with the diamond powder. These conclusions are confirmed by electron microscopic investigations. It is shown that the introduction of ultradisperse fillings (up to 2 wt.%) into such compositions allows us to improve the characteristics of abrasive tools considerably, especially for grinding hard semiprecious stones. The physicomechanical and frictional characteristics of the compositions and specific examples of their application in the jewelry industry and in stone working are discussed.

ABRASIVE TOOLS
polytetrafluoroethylene
native/natural diamond powder
abrasivity

MECHANICS OF COMPOSITE MATERIALS

Veröffentlichungsjahr
2001

Quelle
MECHANICS OF COMPOSITE MATERIALS
Title
Failure analysis of an abrasive cut-off wheel

Author
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Scott CG

Institution
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TechCon Inc, Cleveland, OH USA.

Abstract
The relationship between composition, structure, properties and performance is central to the design, use and failure analysis of engineering components. Thermogravimetric analysis (TCA) and wavelength X-ray fluorescence (WRXF) were applied in evaluating the elemental composition and thermal properties, respectively, of a failed abrasive cut-off wheel. The cutting tool, consisting of a bonded abrasive disc, failed prematurely during the routine sectioning of a steel member. The operator was injured as a result. Analysis indicated an improper mixture of the organic constituents comprising the wheel bonding material. Instead of the uniform wear anticipated under normal cutting conditions, the improper mixture resulted in a degradation of the wheel's mechanical properties, and catastrophic brittle fracture. (C) 2001 Elsevier Science Ltd. All rights reserved.

Veröffentlichungsjahr
2001

Quelle
ENGINEERING FAILURE ANALYSIS

Klassifikation
Engineering
Materials Science

Schlagworte des Autors
ABRASIVE WHEEL FAILURES
composites
tool and die failures
thermogravimetric analysis
X-ray analysis

Thesaurusbegriffe
nicht belegt

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr.
192
A new tooth finishing method with cBN wheel for involute internal spline - Improvement of tooth accuracy with slant traverse method

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An improvement in shift feeling is essential for automobile transmission parts. For this purpose, it is important to increase the accuracy of an involute spline, that is, to perform profile modifications for a pair of teeth in a mesh and to improve roughness as well. Although a homing technique can be effective in meeting the above requirements, it has not been investigated in sufficient detail. A new tooth finishing experiment with a cBN ( cubic Boron Nitrified) wheel for the involute internal spline is performed, and it is revealed that optimum tooth accuracy can be obtained using the slant traverse method, by reducing the speed ratio between revolutions and feeds. The maximum finishing roughness is improved approximately by 50% compared with that before honing. With a speed ratio of psi = 1, roughness values of 4.8 μm Rz in the tooth profile direction and 0.8 μm Rz in the tooth lead direction are obtained. At a revolution load torque of 3 Nm and machining time of 20 seconds, chips are smoothly removed and honing is effective. The conditions for obtaining optimum tooth accuracy and roughness are clarified.
The thermal conductivity of metallic ceramics

Transition metal carbides, nitrides, and borides can be called metallic ceramics because they are electronically conductive and extremely hard. Their various applications include cutting and grinding tools, thermal barrier coatings, diffusion-resistant thin films, interconnects, and superconductivity devices. In each case, the ability of the material to resist or permit heat flow is important. Because of the high concentration of non-metal atom vacancies in the carbides and nitrides, the carriers of heat-conduction electrons and phonons (the quanta of lattice waves) are severely scattered, and the thermal conductivity \( K \) is strongly affected, although differently in high- and low-temperature regions. Measurements of both the electrical and thermal conductivity of single crystal metallic ceramics at low temperatures and the application of the Callaway formalism help explain the puzzling temperature dependence of \( K \). The finding of a large peak in \( K \) of NBC just below its superconducting transition temperature confirms phonon-electron scattering and could lead to a thermal switch. The single-crystal thermal conductivity behavior of TiC and WC is used to interpret the measured \( K \) values for cemented carbides TiC/Ni-Mo and WC/Co through a broad temperature range.
Titel
Reducing vibration exposure from hand-held grinding, sanding and polishing powertools by improvement in equipment and industrial processes

Autor
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Abstrakt
Vibrating hand-held grinding, sanding and polishing tools (GSP) are used in production processes to control surface finish and quality. Their use has been associated with vibration disease for half a century, and may result in damage to the vascular, sensory or musculoskeletal systems. Few GSP manufacturers have addressed the problem of vibration in their products, with most of the grinders on the market only suitable for daily exposure of up to one hour. Observations and discussions in Swedish industry suggest that more controlled and consistent production processes are likely to remove, or reduce, the need for post-production quality control using GSP tools. As the production requirement for this operation is reduced, the duration of the operator's exposure to vibration will also be lessened. Where an elimination of the problem cannot yet be achieved through production quality improvements, better tool design may help to reduce some of the vibration transmitted to the operator. The relatively recent availability on the market of a grinder with an automatic balancing device, as well as the development of antivibration grinders, less vibration prone grinding wheels, and more effective antivibration handles and gloves, may lead to a reduced incidence of vibration disease. (C) 1997 Elsevier Science Ltd.

Veröffentlichungsjahr
1997

Quelle
SAFETY SCIENCE

Klassifikation
Engineering
Operations Research & Management Science

Schlagworte des Autors
nicht belegt

Thesaurusbegriffe
ARM VIBRATION
RAYNAUDS-PHENOMENON
WHITE FINGER
WORKERS
TOOLS
LUMBERJACKS

Sprache
ENGLISH

Recherchedatum
12.03.2021

Dokument Nr. 195
The evaluation of the influence of machining residual stresses on the bending strength of Al2O3 ceramics

HESSERT R
Eigenmann B
Vohringer O
Lohe D

Even after near net-shape processing, machining is often necessary to obtain the required surface quality and precision of dimensions. In industrial applications, machining is in most cases performed by grinding which leads to complex changes of the material properties in the near-surface layers. Since the effects of grinding-induced damage and residual stresses may have competing influences on the strength, the knowledge of these effects is of principal interest. Therefore, Al2O3 samples were machined with different grinding parameters. The near-surface distributions of grinding residual stresses were determined non-destructively by means of depth-resolved X-ray residual stress analyses. It was found that the compressive surface residual stresses increase with increasing depth of cut of the individual grains of the grinding wheels. In parallel, an increase of the 4-point bending strength of the samples was observed. Its magnitude was compatible with the effects of the grinding residual stresses on the bending strength which are expected according to fracture mechanics calculations. It was found that near-surface compressive residual stresses increase the bending strength even if failure from critical defects initiates at depths larger than the thickness of the compressively stressed surface layer.

1996
ZEITSCHRIFT FUR METALLKUNDE
Metallurgy & Metallurgical Engineering
nicht belegt
nicht belegt
GERMAN
12.03.2021
196
CHARACTERISTICS OF SHORT CAST-IRON FIBERS AND THEIR APPLICATION FOR DIAMOND CUTTING WHEELS

LI D
TIAN Y
CAI B
CHEN B

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A study on the effects of compaction and sintering parameters on microstructures and properties of sintered compacts of short cast iron fibres has led to the development of a diamond grinding wheel bonded with a matrix of short cast iron fibres. When compared with high quality bronze bonded diamond grinding wheels the new type of wheel was found to be more suitable for the high efficiency grinding of hard and brittle materials such as ceramics. When Si3N4 was ground, a trebling of the grinding rate and a sixfold increase in grinding ratio was achieved.

1995

POWDER METALLURGY

Metallurgy & Metallurgical Engineering

nicht belegt

nicht belegt

ENGLISH

12.03.2021

197
Titel
Titel serbokroatisch. Einfluss der Profilierungsart der Schleifscheibenschneidflaeche auf die Schleifkraefte und die Rauheit der geschliffenen Oberflaechen. Influence of the grinding wheel cutting surface profiling on grinding forces and ground surface roughness.

Autor
CEBALO, R.

Institution
Jugoturbina, Karlovac, YU

Abstrakt
This work examines the influence of the way and conditions of profiling on the characteristics of the grinding wheel cutting surface, grinding forces and the roughness of the ground surface while creep-feed grinding. Profiling, i.e. sharpening of the grinding wheel surface was performed by a single-diamond, by a diamond roller and by a cementated carbides roller. The obtained results are, according to the experiment plan, valid for the testing of NIMONIC 80 A and for the open grinding wheel. The results can probably be applied to other materials and wheels also, which, however, has to be proved for each individual case.

Veröffentlichungsjahr
1987

Quelle
Strojarstvo * Band 29 (1987) Heft 5, Seite 237-246 (10 Seiten, 5 Bilder, 6 Tabellen, 20 Quellen)

Klassifikation
3LKB Spanende Bearbeitung, Zerspanen, Zerteilen

Schlagworte des Autors
SCHLEIFEN
SCHLEIFSCHEIBE
PROFILIERUNG
EINFLUSSGROESSE
SCHLEIFKRÄFTEN
RAUHEIT
DIAMANTSCHEIFEN
NIMOCR STAHL
DIAMANTSCHEIFSCHERBE
ABRICHTEN
VERSUCHSMETHODE
TIEFSCHLEIFEN
SPANEN (OHNE KONTUR)
FLACHSCHLEIFEN

Thesaurusbegriffe
nicht belegt

Sprache
Serbokroatisch

Recherchedatum
12.03.2021

Dokument Nr. 198
Titel

Autor
MEYER, H.R.

Institution
nicht belegt

Abstrakt

Veröffentlichungsjahr
1980

Quelle
Industrieanzeiger * Band 102 (1980) Heft 46, Seite 38-42 (5 Seiten, 7 Bilder, 8 Quellen)

Klassifikation
3LKB Spanende Bearbeitung, Zerspanen, Zerteilen

Schlagworte des Autors
SILICIUMCARBID
SCHLEIFSCHEIBE
DIAMANT
BORNITRID
KUBISCHE STRUKTUR
SCHLEIFSCHEIBENABRICHTUNG
WERKZEUGWERKSTOFF
VERSUCHSDURCHFUEHRUNG
VERFAHRENSBEDINGUNG

Thesaurusbegriffe
ANWENDUNG

Sprache
Deutsch

Recherchedatum
12.03.2021

Dokument Nr.
199
SYNTHETIC GRINDING TOOLS FOR SMOOTH LEAD GLASS PRODUCTS

LESHCHINSKII DA
EVSTISHENKOVS VS
KLEPIKOV SA
FEIGIN BZ

nicht belegt

1980

GLASS AND CERAMICS 1980 / 10 Vol. 37; Iss. 10

Materials Science

nicht belegt

ENGLISH

12.03.2021

200