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Nanostructured materials

(P. Louda, S. Mitura, T. Bakalova)..... 307
Nanosciences represent actual area of interest of materials engineering. Nanomaterials and nanotechnology have considerable growth potential in many areas of human activity. Modern technology making nanostructures are often based on the “original” technology which nature created our world.

Keywords: materials engineering, nanosciences, application potential

The use of the combination of energy-dispersive analysis and electron backscatter diffraction for the structuroscopy of Fe-Al-Zr-based alloys

(P. Kejzlar, E. Macajová, M. Švec, V. Vodičková)..... 309
Present work deals with a possibility of usage of combination of scanning electron microscopy, energy-dispersive analysis and electron backscatter diffraction for the identification and description

of the structure and phase composition of some selected Fe-Al-Zr-based alloys. By the connection of the above-mentioned methods it is possible quickly and accurately obtain the information necessary for description of the structure of investigated alloys. A big advantage is a possibility of characterisation of arbitrary selected particles, which enables to obtain information about their distribution and morphology.

Keywords: iron aluminides, intermetallics; structure; electron microscopy; phase composition

Application of microbending test on austempered iron

(Z. Andršová, B. Skrbek, L. Voleský)..... 313
This paper describes usage of a microbending testing device to determine mechanical properties of austempered ductile and grey iron (ADI/AGI). There are highlighted possibilities and benefits of microbending test compared to conventional testing methods.

Keywords: microbending test, mechanical properties, austempered iron

Evaluation of the thermal resistance of thin layers

(M. Horák, T. Bakalova, P. Kejzlar, Z. Rozek, M. Fijalkowski, L. Voleský)..... 317
The high-temperature layers are still more unexplored areas in which they are seeking ways to barriers layers. Research of these layers showed choice of the right direction. But further development and research will indicate which types of layers are suitable for use at high temperatures. The aim of this research was to determine the characteristics of the layers (Zr, Cr)O₂, which in the future could be used for high-temperature applications, depending on the thermal influence.

Keywords: high-temperature layers, plasma modification, physical vapour deposition, thermal influence, adhesion, nanohardness

Micromagnetic structuroscopy exhaust valves

(B. Skrbek, B. Zlatuška) 321
This work tie together on previous work conversant of changes austenitic valve steel during operational exposition. Result of measurement have serve for examination of application methods measuring residual magnetism to operating degradation in the area of valve stem and cones. Spot sample valves plus way of measuring with exact position on valves were described in experimental parts. The metering went ahead apparatuses measuring permeability and remanent intensity magnetic field. Then retrieve data was interpretation in the form of graphs for spot sample. Of them were chosen critical section of valves, which were submitted hardness test and metallographical classification textures.

Keywords: valves of reciprocating engines, austenitic steels, magnetic non-destructive structuroscopy

Comparison acoustic and optic characteristics of cast iron-graphite

(B. Skrbek, D. Bílek) 327
Graphite cast irons are still most widespread cast construction material. The classification of cast irons after shape of graphite after ISO 945. The metallography character description of shape and size of graphite does not depict numerical relation to useful properties of given cast iron. There is already thirty years known relation between sound velocity and share of spheroidal and vermicular graphite for cast iron with spheroidal graphite castings checking. The binding onto flake graphite, ledeburitic cementite, size of graphite formations effect is missing. The mathematical models for relation among acoustic properties and parameters of flake graphite and free cementite share and spheroidal graphite size.

Keywords: graphite cast irons, metallography, sound velocity, production control

Geopolymer mixture for heat insulation

(P. Louda, M. Štefan, Nguyen Thang Xiem, Totka Bakalova) 332
This paper subject is an employment of geopolymer mixtures as insulating or protective elements when they are applied to wood. Due to the long-term fire or high temperature effects the wood exhibits its thermal degradation (charring) and a loss of strength parameters. The aim is to determine the basic thermal insulating properties of geopolymers and to suggest their possible application as a fireproof protection in construction, engineering etc.

Keywords: geopolymer mixture, alkaline activation, wood, fire-proof, thermal stress

Using of atmospheric plasma for surface modification of the fillers

(D. Tichý, P. Hájková, J. Matoušek) 335
The fillers for composite materials were modified by dielectric barrier discharge atmospheric plasma in this work – with the aim of increasing their wettability and enhance their adhesion to the matrix of the composite as a benefit of their properties. The fillers used were glass fibres and also pilot tests with PE powder were done. The fillers were exposed to the plasma from 0 second to 10 seconds intervals. The wettability of the fibres was tested and the stability of the modification was studied in time period of four weeks. The significant increase of the wettability was proved in case of all DBD modified samples. The fibres were analysed by SEM. The changes of dispersibility of the PE powder in water was observed. The chemical changes of PE particle surface were measured by XPS.

Keywords: plasma modification, dielectric barrier discharge (DBD), composite materials, ageing

Reviews of thickness of case-hardened, nitrided and carbonitrided layer by analysis method of Barkhausen noise

(L. Schmidová, T. Bakalova) 340
Coating of layers by chemical and heat treatment is primarily used to improve surface properties of the components such as corrosion resistance, wear resistance, fatigue strength etc. Paper shows the rapid evaluation of the thickness of these layers depending on the value of magnetoelastic parameter. This parameter is the output quantity of measuring by method of the Barkhausen noise analysis.

Laboratory for ceramics

(V. Šída, D. Šída)..... 343

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Methods of surface topographical measurements

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ANOTACE

Povlakování dusíkem dopovanou ocelí

(V. Jahodová, T. Suszko)..... 326
Pomocí reaktivního magnetronového naprašování v proměnné pracovní dusíkové a argonové atmosféře byly nanoseny austenitické vrstvy s rozličnou koncentrací dusíku. Struktura vrstev byla zkoumána rentgenovskou difrakcí, koncentrace dusíku byla zjišťována s pomocí GDOES a drsnost vrstev metodou AFM. Byl studován vliv tenkých vrstev na drsnost oceli.

Chemická modifikace uhlíkových nanočástic

(K. Adach, J. Skolimowski)..... 330
Nanodiamanty jsou diamantové částice nanometrových rozměrů. Dokonalá molekula nanodiamantu má schopnost se povrchově vázat s mnoha organickými skupinami. Částice jsou také citlivé na

chemické modifikace. Vzhledem k jejich biokompatibilitě a nízké toxicitě je lze využívat pro biologické materiály, v lékařství, jako nosiče léčiv a jako kovalentní a elektrostatické vazby na aktivní biomolekuly. Tento výzkum popisuje chemické modifikace nanodiamantových prášků, výsledkem výzkumu jsou nové znalosti a porozumění a interpretace jevů vyskytujících se během chemické funkcionalizace nanodiamantových prášků. Zkoumání a analýza mechanismů vzniku chemických vazeb nebo fyzikálních interakcí rozšiřuje znalosti v této oblasti. Prozkoumání účinku organických skupin na povrch nanodiamantu a na jeho fyzikální a chemické vlastnosti přispívá k výběru nejvhodnější metody modifikace. Provedení výzkumu dovoluje rozšířit znalosti v oblasti chemické modifikace povrchu nanodiamantového prášku.

Klíčová slova: nanomateriály, diamantové nanoprášky, čištění, chemické úpravy, povrchová funkcionalizace