

CONTENS

B.D. Annin

A NEW CLASS OF CONSTITUTIVE RELATIONS OF LINEAR

ANISOTROPIC HEREDITARY THEORY OF ELASTICITY 1

The Kelvin approach describing the structure of the generalized Hook's law is used to analyze the constitutive relations of linear anisotropic hereditary theory of elasticity. It is assumed that eigenstates of the tensor of kernels of heredity are time independent and coincide with eigenstates of the tensor of anisotropy of instantaneous elastic moduli, and hereditary operators with kernels in the form of fractional exponential Rabotnov functions act only on their own time-dependent modules tensor hereditary kernels. The maximum number of independent genetic operators is six. Cases of transverse isotropy, orthotropic, cubic symmetry considered.(p. 1-6).

L.R.Vishnyakov

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The using of knitted and knitted-soldered wire meshes for lightning protection of polymer based composite materials are discussed. The meshes are useful for top layers of carbon fiber reinforced plastics that are now used in aircraft constructions and wind power production. The structure and architecture of copper knitted and knitted soldered meshes are presented, as well as a possibility of their properties control (p. 7–15; fig. 8).

Yu.R. Kolobov, V.N. Perevesentsev, S.S. Manokhin, Yu.E. Kudymova, A.Yu. Kolobova, A.M. Bragov, A.Y. Konstantinov

FEATURES OF STRUCTURE FORMATION AND DEVELOPMENT OF PLASTIC DEFORMATION

UNDER DYNAMIC LOADING OF COARSE-GRAINED AND NANOSTRUCTURED TITANIUM 16

Mechanical behavior and microstructure changes under dynamic loading of nanostructured (NS) and coarse-grained (CG) titanium VT1-0 have been investigated. Features of deformation evolution under the studied conditions under dynamic loading at various stages are discussed. Influence of the loading rate on the mechanical properties of studied materials is analyzed (p. 16–28; fig. 9).

Fedulov B.N., Safonov A.A., Nguyen N.Q., Lomov S.V.

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MANUFACTURING DEFECTS IN VACUUM-INFUSED AUTOMATED PLACEMENT LAMINATES 29

In this paper the investigation on crack resistance of vacuum infused composites with manufacturing defects, manufactured of dry fiber preforms fabricated by automated placement (DFP / ATL) processes is reported. The study discusses the case of possible crack initiation resulting from process thermal influences caused by differences in coefficients of thermal expansion (CTE's) of matrix and fiber reinforcement, and by shrinkage of matrix. Strain field within a representative volume surrounding a defect is modelled by finite element method. The results of parametric analysis show that under typical conditions of carbon/epoxy composites fabrication a matrix exhibits a sufficient strength to withstand thermal and shrinkage stresses occurring during cure of laminates containing gaps, however, the margin of safety is relatively small and variations in temperature conditions may result in crack formation (p. 29–46; fig. 11).

H.L. Gajera and L.M. Manocha

LOW TEMPERATURE THERMAL EXFOLIATION OF GRAPHITE OXIDE UNDER NORMAL

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The present research work elucidates a simple method for large scale production of few layered Graphene by low temperature thermal exfoliation at 230°C under normal atmospheric pressure. Exfoliation occurs due to pressure generated from decomposition of oxygen functional groups, good enough to exfoliate Graphene sheets from graphite oxide. XRD of exfoliated material (EG230) showed disappearance of characteristic graphite peak confirming complete exfoliation of graphite oxide to graphene sheet. These were further characterized by SEM, TEM, Raman spectroscopy and for surface area measurement by BET method. The TEM and SAED results exhibited presence of few layered Graphene in the exfoliated graphite oxide. The graphene so prepared exhibited higher specific surface area (about 1280m²/gm) as compared to that of as such graphite oxide (about 220 m²/gm) (p. 47–57; fig. 9).

P.M. Bazhin, A.M. Stolin, N.V. Titov

TiC-W₂C-CO PROTECTIVE LAYERS OBTAINED BY ELECTRO-ARC COATING

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A protective coating based on TiC-W₂C-Co was applied on steel 65G by electro-arc surfacing in argon. Microstructure and phase composition of the obtained layers were analyzed, microhardness distribution from the surface to the metal was measured. It was found that during the coating process composite carbide particles are formed; they consist of titanium carbide grains of 100 μm in size either enriched or unenriched by tungsten. The applied layer is shown to contain up to 70-80 % of carbide phase (p. 58–65; fig. 6).

V. A. Shcherbakov, V. T. Telepa, and A.V. Shcherbakov

FUSED TiC-BASED COMPOSITES BY ELECTROTHERMAL EXPLOSION UNDER PRESSURE 66

Fused TiC-based cermet composites with Fe and Ni binders were prepared by electrothermal explosion (ETE) under pressure in a one-stage process. A potential of this technique was illustrated on the examples of TiC-Ni and TiC-Fe composites. ETE explosion in Ti-C-Ni blends was found to yield a material comprising the TiC grains uniformly distributed over the Ni binder. In order to prevent Fe + C reaction at the stage of synthesis, the TiC-Fe cermet was obtained through impregnation of a melted Fe layer into a porous TiC carcass. Thus prepared cermet disks and cylinders exhibited the following characteristics: ρ = 4.4, and 5.4 g/cm³ for TiC, TiC-30 wt % Ni, and TiC-30 wt % Fe, respectively; and microhardness H_v = 25.8 and 30.5 GPa for TiC-30 wt % Ni and TiC-30 wt % Fe, respectively (p. 66–76; fig. 8).