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Abstract

Abstract
Thermoplastic polyimide based on dianhydride 1,3-bis-(3,4-dicarboxy- phenoxy)benzene and 4,4'-bis-(4''-aminophenyltio)diphenyloxide and prepolymers ITA obtained by melting of di- and tetraacetyl derivatives of diamine with dianhydride were synthesized.

Abstract
Briquettes from anthracite and coke breeze has been produced using the starch glue as a binder. The strength of obtained briquettes has been analysed in relation to the varying briquetting parameters including pressing pressure, amount of binder and temperature of heat treatment of raw briquettes. To examine the distribution of binder in a briquette, optical microscopy has been applied. It has been found that the briquettes produced with a 15 and 9 % addition of binder for anthracite and coke breeze, respectively, and dried in the range of 110—130 °C show the highest strength. Heat treatment at higher temperature results in the worsening of strength properties of briquettes due to thermal depolymerization of the binder. Water resistance of the prepared briquettes has been improved by polymer addition to the starch binder.

Abstract
Fracture properties of unidirectional carbon-carbon composites made of three types of PAN-based carbon fibres Torayca embedded into a phenolic resin based carbon matrix were investigated at room temperature. The Hopkinson split bar technique was used for a quantitative evaluation of resistance to through-the-thickness crack propagation in impact--loaded notched specimens. After heat treatment to 2500 °C the absorbed energy was higher if compared to the brittle fracture of the carbonized (at 1000 °C) specimens. For the latter material the fibre strength seems to control the crack propagation. A more complex failure mechanism of the graphitized composites prevents its quantitative description in terms of a single fracture mechanics parameter.

Abstract
The composite quality is largely given by preparing procedure. In article we deal some aspects of preparation and characterization of composites with reactoplastic matrix and their transformation into C/C composite. The general principles are illustrated on carbon fiber composite with phenolformaldehyde matrix. The additional filling of cavities and pores by impregnation C/C composites are also discussed.

Abstract
Impact toughness and micromechanics of fracture processes in unidirectional (UD) carbon-carbon composites have been evaluated by means of an instrumented pendulum hammer and a scanning electron microscope. The effect of different heat treatment of phenol-formaldehyde resin, a precursor of composite matrix, upon interfacial bond strength and impact behaviour has been studied. Impact toughness can be enhanced by graphitization of the matrix due to a reduction of interfacial adhesion. Significant differences in fracture surface morphology have been observed between carbonized and graphitised carbon matrix composites.

Abstract

To determine etheric oxygen in chemically and physically heterogeneous maceral fractions of bituminous coals, the method combining diffuse reflectance infrared Fourier transform spectroscopy (DRIFTS) with the advanced statistic partial least-squares method (PLS) was developed. The DRIFTS-PLS method yields exact and accurate results, as it was demonstrated by the determination of etheric oxygen in 26 standards and 14 samples of coal maceral fractions. Quickness is an important feature of the method, as it reduces the duration of the determination from tens of hours to several minutes. For this reason, the method is suitable for analyses of large sets of heterogeneous samples.

Abstract

As a result of pyrolysis of carbon fibre reinforced polymer composites (CFRP) based on a polyimide matrix ITA, carbon fibre reinforced carbon composites (CFRC, carbon-carbon) with maximum values of flexural strength – 310 MPa, tensile modulus – 95 Gpa and shear modulus -7.2 GPa were obtained. The CFRC composite material has a monolithic structure and can undergo brittle failure with crack spreading normal to the fibers. The carbon yield of the ITA polyimide resin can attain 75-80 % in the composite, which is 1.5-1.8 times greater than that of the UMAFORM phenolformaldehyde resin in the composite. It is suggested that the high carbon yield of ITA in the composite is due to the monolithic structure forming of the CFRP composite during its thermolysis up to 1000 °C and to an increase in adhesion between the fiber and the matrix.