POLSKA AKADEMIA NAUK
CENTRUM MATERIAŁÓW POLIMEROWYCH I WĘGLOWYCH

Rozprawa doktorska

Otrzymywanie i właściwości fizykochemiczne kompozytów biomorficznych z roślin włóknistych

Justyna Majewska

"... Use raw materials and feedstock that are renewable rather than depleting. Renewable feedstock are often made from agricultural products or are the wastes of other processes"

The Green Chemistry
Priciples by Paul Anastas and
John C. Warner

Promotor

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Praca częściowo finansowana przez MNiSW w ramach grantu promotorskiego N N209 100637

Zabrze 2010

The development of biomorphous composites from vascular plants and their physicochemical properties

Abstract

The aim of the study was to develop the technology of manufacturing of biomorhous carbon/carbon and carbon/polymer eco-composites, and to study the physicochemical properties of the resultant materials. Two species of vascular plants: bamboo (*Dendrocalamus strictus*) and yucca (*Yucca flaccida*) were used as precursors for monolithic, porous carbon supports. Rectangular shapes cut from the plant stems were carbonized at highly controlled conditions in a wide range of temperatures ranging from 300 to 950°C. The next step of the work was to develop the technology of composite manufacturing using the biomorphous monolithic supports. Two types of polymers: poly (furfuryl alcohol) (PFA) and chitosan were used as fillers. At each stage of production of the supports and the resultant composites many important physicochemical properties were measured. The elemental and the thermal analyses (TGA, DSC) were performed. On the basis of the densimetric measurements, the true density and the bulk porosity were determined. The pore size distribution was obtained using low-temperature nitrogen adsorption and mercury porosimetry. The ultrasound velocity, electrical conductivity and the functional groups of the materials (Boehm method, FT-IR) were also measured. Microscopic texture observations were carried out using scanning electron microscopy and optical microscopy. The obtained new, eco-composites are characterized by hierarchical pore structure, as well as by unique properties. These materials are expected to be useful in many fields, i.e. they can be adsorbents, filters, etc.