

Nanocomposites and nanomaterials

Epoxy polyurethane nanocomposite material with Fullerite for medicine

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The goal of work — creation of nanocomposite materials on basis of biocompatible epoxy polyurethane and Fullerite for the use in medicine, and research of effect of nanofiller on the physical, mechanical, thermal properties of the composite material, its structure, capacity for biodegradation in conditions *in vitro*.

Epoxy polyurethane obtained by reacting isocyanate prepolymer (IPP) on basis of POPG 2000 and 2,4;2,6-TDI at molar ratio of 1.0: 2.0 to epoxy resin ED-20 at molar ratio of ED-20: IPP = 5.0: 1.0. In the resulting reaction mixture (NCO ~ 7.6-7.8 %) the calculated amount extender 1,4-butanediol was injected. The reaction is carried out at a temperature of (75±5) °C until exhaustion of the isocyanate groups. Fullerite (Acros Organics (Belgium) C60-68.7%; C70-27.1%) was introduced into the composition an amount of from 0.01 to 0.2 percent by weight.

The dependence of the tensile strength of the compositions on the content of Fullerene is non linear. A decrease in tensile strength with a maximum at 0.08 wt. % of Fullerite can be explained by the effect of small amounts of impurities and the formation of a defect-free matrix. According to DSC results Fullerite in the composition leads to a change in the temperature of decomposition of the material. There is increase of the thermal stability of composite materials with growth of nanofiller content, changes of heat capacity of polyurethane and epoxy components with the glass transition temperature. Modify the thermo-physical properties of the compositions reveal the influence of Fullerite on structure of EPU composite materials. When conducting comparative physical-mechanical and physical-chemical tests of developed compositions before and after incubation in a model biological environment was found that the nanocomposites exhibit the ability to biodegraded, the presence of nanofiller in the EPU composition contributes to this process.