

Poly lactide-silica composites for biomedical application with controlled release of active agents

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Biodegradable natural polymers have many medical applications in controlled delivery systems active substances. In recent years, many efforts have been made to the development of new polymer materials from renewable resources. Among the biopolymers used in medical and pharmaceuticals industries these days, polylactide (PLA) is considered as one of the best materials. The formation of nanocomposites based on hybrids of an organic matrix and inorganic materials can show improved characteristics. This work is devoted to the development of synthesis methods and the study of properties of composites in which the base is silica and aminosilica, and the main function of the polymer matrix is performed by polylactide (PLA). The production of composite materials was carried out by polymerization of *L*-lactide with the opening of its ring in the surface layer of a silica. Obtained materials were characterized by FTIR, TG and tested *in vitro* release active components. Active ingredient of diclofenac sodium (99.5 wt.%, Vaishali Pharmaceuticals, India) and ibuprofen (98.5 wt.%, Sigma-Aldrich) was used as received. Immobilization of the active component on polylactide-silica composites was performed by mixing of 1 g of carriers with 1.5 mL of ethanol solution of diclofenac sodium or ibuprofen (50.0 mg/mL). After impregnation for 24 h the drug-loaded materials were filtered and dried at 80 °C for 3 h. *In vitro* release studies of the prepared biocomposites were executed according to the requirements of the State Pharmacopoeia of Ukraine by the rotating basket method. The active agent concentrations in the release liquids were registered spectrophotometrically by measuring the increase in absorbance at 230 nm for ibuprofen (Fig. 1) and diclofenac at 276 nm (Fig. 2).

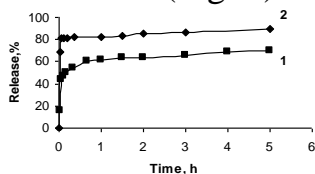


Fig. 1. Release of ibuprofen from composites Silica/PLA (1) and Silica-NH₂/PLA (2)

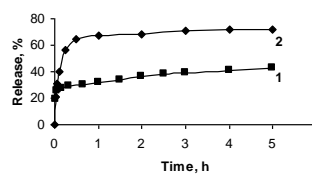


Fig. 2. Release of diclofenac from composites Silica/PLA (1) and Silica-NH₂/PLA (2)

Release of active agents was demonstrated to depend on the different surface functionalities of the silica carriers in the polylactide-silica composition.