

Nanocomposites and nanomaterials

Preparation and characterization of silica-Enoxil nanobiocomposites

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Recently, much attention is focused on a comprehensive study of bioactive compounds of plant origin. The Enoxil is a mixture of natural compounds obtained by the oxidation of tannins extracted from grape seeds. It is a preparation with strong antibacterial and antifungal properties. Along with the search for new biomolecules and study on their effectiveness, much attention today is paid to the selection of combinations of bioactive compounds exhibiting synergistic effects, as well as to the preparation of more complex forms that ensure the most efficient use of each active substance. One of the possible components of such systems (active carrier of different types of molecules) is nanosized silica. Preparation of biocomposites based on silica nanoparticles may integrate in one form several active substances with different mechanisms of action, increase their bioavailability and stability, provide prolonged release of active substances. The aim of this work was to prepare and study the nanosilica-Enoxil biocomposites.

Fumed silica with S_{sp} 300 m²/g (A-300, Kalush, Ukraine) was either mechanically mixed with Enoxil powder (produced at the Institute of Chemistry, Academy of Sciences of Moldova) or modified with aqueous solution of Enoxil in a reactor with a mixer with subsequent removal of water. The Enoxil:silica ratio was 1:6.7 which, in the case of planar situation of biomolecules on silica surface, provides approximate theoretically calculated monolayer.

FTIR spectroscopy studies revealed that surface silanol groups are involved in interaction with biomolecules even in the case of mechanical mixture, however, no monolayer was formed even when silica was modified with Enoxil solution. TGA studies have shown differences in thermal behaviour of silica-Enoxil composites prepared in two above mentioned ways. Further studies will be focused on antioxidant and antibacterial properties of the nanocomposites obtained.

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