Biodegradable composite materials on base of cellulose acetate

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Cellulose esters represent a class of polymers that has the potential to participate in the carbon cycle via decomposition of the resulting cellulose and organic acids. Cellulose acetate is currently used in high volume applications ranging from fiber, to film, to thermoplastics. It has the physical properties and relatively low material cost that have excluded other biodegradable polymers from being widely accepted in the market place. Organic/inorganic polymer hybrids are a rapidly growing area of research [1]. There are several routes to prepare hybrid materials, but one of the most common method is sol-gel technique generating inorganic phase within organic polymer matrix. This process includes hydrolysis of the precursor (metal alkoxide) followed by condensation reactions of the resulting hydroxyl groups. Considering the nature of the interface between the organic and inorganic phases, hybrid materials can be prepared. A preparation stages of hybrids was as follows [2].

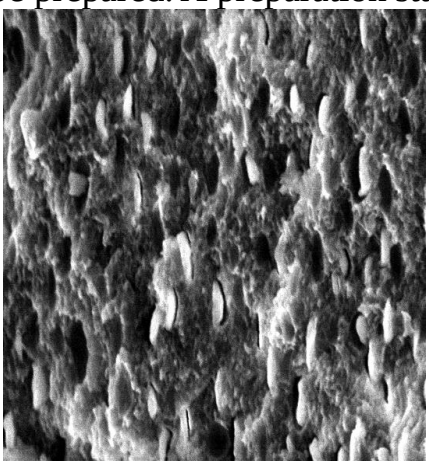

Fig. SEM image of organic-inorganic hybrid

Cellulose acetate butyrate powder was placed in a beaker and dissolved in acetone. Plasticizer (propylene glycol) and TEOS were then added and mixed vigorously. To this solution catalytic amount of HCl (0.1 M) was added to initiate the sol-gel process. The solution was cast in PTFE dish and left exposed to atmospheric conditions followed by drying in an oven at 60°C for 6 hours to ensure complete solvent evaporation. The prepared films were characterized by DTA, X-ray diffraction, IR-spectroscopy, and scanning electron microscopy (SEM) (Fig.). Mechanical properties were investigated using a universal tensile machine (RMI-5).

1. V.T. Phuong, *et al*., J. Renew. Mater. **2** (2014) 35.
2. P. Wojciechowska, *et al*., J. Spectr. **13** (2013) 1.