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BIODEGRADABLE HYBRID NANOCOMPOSITES OF STARCH/LYSINE AND ZNO NANOPARTICLES WITH SHAPE MEMORY PROPERTIES

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ABSTRACT

In food packing applications; the research works have been focused on the development of biodegradable packing materials by using biopolymers such as starch, carrageenan, agar, and gelatine to replace with petroleum-based non-biodegradable polymers. In this present work we studied novel synthesis of biodegradable hybrid nanocomposites using starch, amino acid (Lysine), polypropylene glycol (PPG) and ZnO nanoparticles (NPs) and their shape memory properties. A series of hybrid nanocomposites were prepared by solution casting method, with various ZnO nanoparticles content such as 0 wt%, 1 wt%, 3 wt% and 5 wt% by keeping peptide content constant and varying the ratio between starch and ZnO nanoparticles content. The thermogravimetric analysis (TGA) of the hybrid nanocomposites suggested increased thermal stability with increasing ZnO nanoparticles content. The solubility of the hybrid nanocomposites in H_2O is decreased with increasing ZnO nanoparticles content. The moisture content in the hybrid nanocomposites is decreased with increasing ZnO nanoparticles content. The mechanical properties of the materials were increased with increasing ZnO nanoparticle content. Furthermore, the hybrid nanocomposites showed a shape memory properties by placing the sample at room temperature and then at 55°C. The morphology of the hybrid nanocomposites was revealed using scanning electron microscopy (SEM). We believe that these biodegradable hybrid nanocomposite films can be useful in food packing applications.

Key words: Rice Starch; Lysine; Polypropylene glycol; ZnO Nanoparticles; hybrid nanocomposites; shape memory effects.