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INFLUENCE OF NANOCLAY ON BIODEGRADABILITY OF POLYURETHANE BIO-NANOCOMPOSITE BASED ON CHITIN

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Biodegradable polyurethane has received considerable attention over the past two decades because it has excellent physical properties, and good biocompatibility and biodegradability. This kind of polymers is generally synthesized by incorporating soft segments susceptible to hydrolysis, such as poly (?-caprolactone), poly (glycolide), poly (lactide) into polyurethane. Poly (?-caprolactone) is a biodegradable, biocompatible, and semi-crystalline aliphatic polyester. It is degradable hydrolytically; however, it has not been utilized as frequently as other degradable aliphatic polyesters due to its low degradation rate. The introduction of a polysaccharide chain extender such as chitin can accelerate the degradation rate. Chitin is crystalline polysaccharide and degradable enzymatically by microorganisms. In nanocomposites with an exfoliated morphology due to high miscibility between the polymer matrix and the organic modifier, spherulite nucleation is low. The bulk crystallization rate is slower, and the extent of crystallinity is much lower than that of neat polymer. In this study we synthesized novel polyurethane bio-nanocomposite based on chitin with different proportion of modified nanoclay, by in-situ polymerization. The state of dispersion of nanoclay particles and its effects on crystallization of synthesized samples was analyzed by WAXD. The results showed that the nanoclay was exfoliated in bio-nanocomposites, and reduce the crystallinity. To study the biodegradability of synthesized samples, we used hydrolytic degradation test. Since water molecules can easily diffuse into the amorphous region of the polymer, the hydrolytic degradation occurs preferentially in the amorphous region rather than the crystalline region, and then exfoliated nanoclay could develop the rate of hydrolytic degradation due to the effect of nanoclay on crystalline reduction of the nanocomposites.