Abstract

The gelatin backbone was grafted with various co-polymers of vinyl acetate (*e.g.* Butyl acrylate, acrylic acid, methacrylic acid and acrylonitrile). A total of 6 grafted gelatin based polymers were obtained through the free radical polymerization technique using ammonium per sulphate as the initiator with constant stirring and heating at 80 °C. These six polymers were fully characterized through FTIR, TGA and DSC. The nano composites of all these six polymers were prepared by adding suitable quantities of nanoparticles (such as nano particles of $CaSO_4$ and $SrSO_4$ salts). The biodegradation of these polymers was studied using soil burial method ranging over two months (60 days). The degradation studies of polyvinyl acetate only (1a) showed degradation up to 7.33% while the degradation of gelatin grafted polyvinyl acetate (2a) was increased considerably and degraded up to 29.59%. The gelatin grafted copolymers of vinyl acetate with butyl acrylate (3a). Acrylic acid (4a), methacrylic acid (5a) and acrylonitrile (6a) degraded up to 15.68, 37.28, 23.21 and 29.16 percent respectively. In the bigening an increase in weight of these polymers was observed which may be attributed to the moisture absorption. After that a constant decrease in weight was observed. The degradation of gelatin grafted copolymer of vinyl acetate with acrylic acid showed highest degradation. The nanocomposites of these grafted copolymers with $CaSO_4$ and $SrSO_4$ nano particles showed an increased resistance against biodegradation. The degradation of gelatin-g-poly(vinyl-co-acrylic acid) nanocomposites decreased to be at 25.68% and 15.05% with $CaSO_4$ and $SrSO_4$ respectively. The gelatin-g-(vinyl acetate-co-acrylonitrile) also showed good degradation rate of 29.16 and its nanocomposites were degraded upto 16.19% and 11.76% respectively. Polymer nanocomposites of $SrSO_4$ showed increased resistance to biodegradation as compared to $CaSO_4$ nanoparticles. Also the nanocomposites of grafted copolymers were less susceptible towards moisture absorption. Results showed that the grafting was a versatile tool to impart biodegradability to non-biodegradable polymers. The addition of nanoparticles gave them a resistance against microbes up to an extent. Therefore these materials can be used effectively as active biodegradable packaging food materials.