

Preparation of Printable and Biodegradable Cellulose-Laponite Composite for Electronic Device Application

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Abstract

Printable and biodegradable printed circuit boards (PCBs) prepared by using cellulose as the continuous matrix, laponite as flame retardant filler with various weight ratio (0, 5, 10 and 20 wt% with respect to the α -cellulose quantity used to prepare the composites) and 1-ethyl-3-methylimidazolium acetate ([emim][OAc]) as the recoverable dissolution medium. Prepared cellulose-composites were subjected into physical, chemical, thermal, mechanical and biodegradation analyses to check the suitability of the cellulose-laponite composite for biodegradable electronic application. The addition of laponite into cellulose increased the degradation temperature, flame retardancy and decreased the mechanical properties of the cellulose-laponite composites. The surface nature of the cellulose composite converted from hydrophilic to hydrophobic (contact angle value increased in the range from 50° to 112°) by treating with relatively small amount of hydrophobizing agent (< 1 wt%). The conductive ink printing experiments on the composites explaining the role of hydrophobizing agent and laponite in the composites. Biodegradability of the cellulose was evaluated by enzyme treatments and derived the effect of laponite, hydrophobic agent and conductive ink.

Keywords:

α -Cellulose, Laponite clay, Ionic liquid, Hydrophobic agent, Biodegradable electronics

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