J Material Sci Eng 2015, 4:4
http://dx.doi.org/10.4172/2169-0022.S1.023

Effect of fibre surface modifications on crystallization and thermal behaviour of poly lactic acid (PLA)-natural fibre composites

Emmanuel I[1], **Adeosun S O**[2], **Lawal G I**[2] and **Balogun S A**[3]
[1]Ambrose Alli University, Nigeria
[2]University of Lagos, Nigeria
[3]Bells University of Technology, Nigeria

Production of biodegradable polymer composites mostly presents the problem of poor interfacial adhesion between fibre and the matrix. This challenge often results in poor crystallization ability and thermal responses resulting in poor service performance of packaging and structural polymer composites. This study focuses on measuring the effectiveness of two recently developed fibre surface modification paths on crystallization and thermal behaviour of PLA - natural fibre composites. Cellulosic fibres from Groundnut shell (G), Coconut shell (C), Rice husk (R), Palm fruit bunch (PB) and Palm fruit stalk (PS) processed using two processing paths (M1 and M2) are used as reinforcement in poly lactide (PLA) to produce biodegradable polymer composites for structural and packaging applications. Crystallization and thermal responses of the composites are studied in relation to improvement in surface adhesion of the fibres. Crystallization behaviour, melting, glass transition and cold crystallization temperatures are deduced from Differential Scanning Calorimetry (DSC) thermograms. Results show that the introduction of fibres also led to a decrease of the cold-crystallization temperature (Tcc) for all composites indicating that the fibres serve as nucleation sites for the onset of crystallization of the composites. An increase in crystallinity of the composites (about 100%) over that of the virgin PLA is also observed, indicating improved thermal and structural properties. The maximum crystallinity obtained in this study is higher than those of materials currently used for packaging (bottles) by about 119% showing the suitability of the developed paths for processing natural fibres for biodegradable packaging applications. The melting temperatures of all composites are found to be higher than that of virgin PLA showing that the composites possess a higher molecular weight than PLA.

emma_eia@yahoo.com

Orderly perforation of polymer films by excimer laser for possible use as scaffold materials in tissue engineering

Erol Sancaktar[1], **Efkan Çatıker**[2], **Kimberly Sloan Stakleff**[3] and **Kelly Carr**[3]
[1]The University of Akron, USA
[2]Ordu University, Turkey
[3]Calhoun Research Laboratory, USA

This study involved the effects of excimer laser perforation of biodegradable (PHB and PLA) and non-biodegradable (PU/PDMS and PMMA) polymer films on cell proliferation on and around them in cell culture cells. The ultimate goal is to use such membranes as scaffold materials in tissue engineering. The cell-matrices interactions were examined based on the proliferation of human fibroblast cells cultured on the laser-perforated membranes, and as well as on the as-cast films and tissue culture plastic for comparisons. Our cell culture tests using the perforated PLA and PMMA membranes revealed significant improvements in cell proliferation when compared with the corresponding cases of as-cast films. We can conclude, therefore, that laser-induced perforation of biodegradable PLA and non-biodegradable PMMA polymer films with perforation sizes of up to 43 μm can render them effective scaffold materials for tissue engineering.

erol@uakron.edu