conferenceseries.com

J Bioremed Biodeg 2016, 7:5(Suppl)
http://dx.doi.org/10.4172/2155-6199.C1.003

3rd International Conference and Exhibition on
Biopolymers & Bioplastics
September 12-14, 2016 San Antonio, USA

Balancing performance and sustainability in natural fiber-reinforced composites

Umeyr Kureemun[1], **Lee Heow Pueh**[1], **Tran Le Quan Ngoc**[2] and **Yucheng Zhong**[1]
[1]National University of Singapore, Singapore
[2]Singapore Institute of Manufacturing Technology, Singapore

Natural and synthetic fibers have been used increasingly as matrix reinforcements in various applications. While the latter is popular for its generally superior mechanical properties, natural fibers are environmental friendly and sustainable. As more businesses are inclined towards going green, natural fibers are gaining increasing attention in recent years, often as a substitute or as a complementary to glass fibers. However, its utilization is usually bound to applications in not requiring high mechanical performance. In this study, we investigate an extended use of natural fibers in polymeric composites to structural applications requiring higher mechanical performance, through hybridization with carbon fibers, aiming at a good balance between performance and sustainability. Having more than one fiber type in a polymer matrix gives greater flexibility in achieving optimal characteristics with a proper understanding of the material behavior and failure mechanics. Experimental investigation was carried out on various flax-carbon reinforced polymer hybrid systems fabricated using a custom-designed composites prepreg extrusion plant, suitable for large-scale industrial output, to impregnate fibers with a recyclable polymer, which are then hot-pressed, producing composite laminates with high fiber volume fraction. The reinforcing effect of carbon in flax-polypropylene composite at various carbon fibre loadings is determined with regards to the hybrid's strength and stiffness under tension and bending.

uk.me@nus.edu.sg

Reticulation mechanism of advanced diacrylate cis-1,4-polyisoprene with temperature: *In situ* investigations on thin films by infrared and Raman spectroscopies

Kenza Ayche, **Jean François Bardeau**, **Jean François Pilard** and **Nicolas Delorme**
Institut des Molécules et Matériaux du Mans, France

The increasing number of mobile devices and the race to energy sobriety make the decrease of the size of microelectronic systems (MEMS) a major challenge. Today, lithium micro batteries are currently the best solution for high-power and energy applications. Incorporate them into credit cards containing a screen or associate them to electronic sensors for the supervision is the challenge which raises international companies such as ST Micro Electronics. However, these micro batteries contain some lithium metal which can be dangerous if the metallic lithium is in contact with water or humid air. In addition, the substance can spontaneously ignite in the contact of the humidity. So, in order to avoid the problems of safety, we absolutely have to protect the lithium contained in our micro batteries using an encapsulation layer. Polymeric encapsulation has the advantage, compared with other materials (ceramic, metal), to present a moderate cost of shaping and a low weight. However, such systems of encapsulation are insufficient to guarantee a satisfactory life cycle of components. Indeed, in the presence of humidity or important temperature variation, the mechanical assemblies can be weakened and engender an irreparable break. Our project is thus to develop thin encapsulation layers of polymers based on natural rubber. The interesting physical and chemical properties of such polymers represent an attractive alternative to existing packaging materials. Moreover, in addition to their barrier properties against water and air, these polymers are known to be ecological, very flexible and have a good elasticity. Diacrylate oligoisoprene derived of natural rubber is associated with a thermal initiator known for its capacity to crosslink a large range of polymers. The process consists of forming a thin film by dip coating a substrate into a polymer/di-sulfonyl azide mixture and then thermally anneal the film up to a temperature at which the sulfonyl azide decompose. The effects of both the selected annealing temperature, the heating rate and the reaction time were investigated using Fourier transform infrared spectroscopy and Raman spectroscopy. A full analysis of the vibrational spectra provides significant information regarding the thermal reticulation. Our investigations allowed us to determine both the kinetics of thermal cross linking and the main parameters that can help to develop industrial thermal process. This project is realized in collaboration with ST Micro Electronics and applications in micro batteries will be discussed.

kenza.ayche@live.fr