*Invited Speaker*

International Symposium on Advanced Polymeric Materials 2016 (ISAPM 2016)

**Performance Evaluation of Polyurethane-Kenaf Foam Composites for Shock Cushioning and Packaging Applications**

Azlan, M.A.1 and David, N.V2,\*

1Sirim QAS International Sdn. Bhd., No. 1, Persiaran Dato' Menteri,
40000 Shah Alam, Selangor Malaysia

2Faculty of Mechanical Engineering Universiti Teknologi MARA (UiTM)

40450 Shah Alam, Selangor, Malaysia

\*davidfkm@salam.uitm.edu.my

**ABSTRACT**

Packaging materials for logistical purposes are designed to protect electrical and electronic products and other fragile consumer goods from damages due to shock and excessive vibrations during handling and transportation. Material sustainability is often associated with the extraction of renewable resources and disposal procedures that would not damage our ecosystem. In this respect, indigenous agro-waste resources or industrial crops would be a smart alternative to fabricate lightweight and disposable green- materials at low cost. This paper chiefly presents the shock cushioning and water absorption properties of polyurethane (PU) foam composites filled with kenaf fibres and saw dust (SD). These properties are directly relevant to the use of such bio-based composites as cushioning foam for packaging materials. The PU/kenaf samples were prepared with filler size ranging between 355μm and 500μm and with 5, 10, 15, 20 and 25 wt% filler loadings. The moisture absorption properties of the composites are determined based on the ASTM-D5229 test method. The diffusion rates from the moisture absorption test are calculated using Fick’s Second Law equation. The variation in the moisture absorption curve of the samples are attributed to their cell structure. The shock cushioning test is performed in accordance with ASTM-D4168 standard for selected composites only. In this test, the composites are subjected to five static stress loading levels, i.e. 39.22, 94.9, 225.10, 320 and 398.43 kg/m2. The shock cushioning performance of the PU/kenaf composite is compared to that of PU/SD composite. The decelerations experienced from the drop represent the fragility factor or *G* value of the products. The results obtained indicate that the *G* values generally decrease with increasing static stress loading for both types of fillers. The outcome of this study signifies the potential of kenaf as fillers in PU foam for applications that have traditionally depended on 100% PU foams alone.

***Keywords***: foam bio-composites; kenaf; moisture absorption; shock cushioning; packaging