



LECITHIN MODIFIED KAPOK FIBER/HYDROXYPROPYL METHYLCELLULOSE/GRAPHITE COMPOSITES: THERMAL AND ACOUSTIC PROPERTIES

Daiana M. F. Sandrini^{1,*}, Balaji Krishnasamy², Marina F. Pillis³ and Denise F. S. Petri¹

¹ – Institute of Chemistry, University of São Paulo (USP), São Paulo, SP, Brazil daiana_dmf@hotmail.com

² – Polymer Engineering Laboratory, PSG Institute of Technology and Applied Research, Neelambur, India

³ – Nuclear Energy Research Institute (IPEN), São Paulo, SP, Brazil

Abstract - Natural fibrous materials are interesting for sustainable building construction materials¹. In this work, kapok fibers (KF) were modified with soy lecithin (SL) to enable the compatibilization with hydroxypropyl methylcellulose (HPMC). KF, which are hollow hydrophobic fibers (Fig. 1a), turned hydrophilic after the modification with SL (Fig. 1b), which contains two hydrophobic chains and a zwitterionic (PO_4^{3-} and NH_4^+) head group. Elemental analysis (CHN) and FTIR-ATR spectra evidenced the presence of SL on the surface of KF. Composites of KF-LS (72 wt%) and HPMC (28%) presented mean apparent density (ρ) of $0.051 \pm 0.005 \text{ g/cm}^3$. When the amount of HPMC was kept constant, but KF/LS was partially substituted by graphite (G), the composites HPMC/KF-LS/G0.2 (28 wt% /59.4 wt% /12.6 wt%) and HPMC/KF-LS/G0.3 (28 wt% /56 wt% /16 wt%) (Fig. 1c) presented ρ values of $0.059 \pm 0.002 \text{ g/cm}^3$ and $0.058 \pm 0.009 \text{ g/cm}^3$, respectively. The thermogravimetric analysis (TGA) showed that the temperature of degradation increased from 306 °C (HPMC/KF-LS) to 312 °C (HPMC/KF-LS/G0.3), and the ash content increased from 10% (HPMC/KF-LS) to 22% (HPMC/KF-LS/G0.3). The sound absorbance coefficient of HPMC/KF-LS increased as the frequency increased, achieving a maximum value of 0.45 at 1500 Hz, which is like other natural fibers¹. These findings indicated that the novel HPMC/KF-LS/G composites could be applied as green building materials.

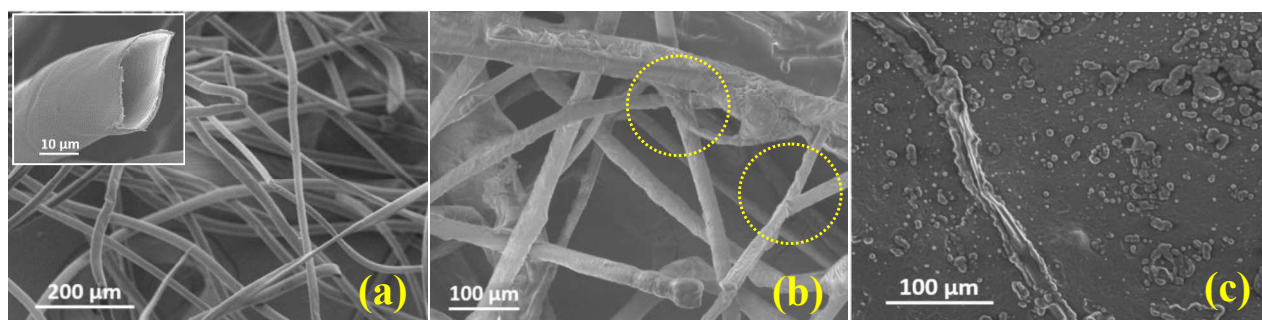


Figure 1 – SEM images of (a) KF, (b) KF-LS and (c) HPMC/KF-LS/G0.3.

References.

1. U. Berardi; G. Iannace *Building and Environment* 2015, 94, 840. <http://dx.doi.org/10.1016/j.buildenv.2015.05.029>

Keywords: kapok fiber, soy lecithin, hydroxypropyl methylcellulose, graphite, composites