

## Characterisation of phenolic resin and nanoclay admixture and its effect on impreg wood

### ABSTRACT

Bulking treatment with low molecular weight phenol formaldehyde (LmwPF) resin has been found to successfully enhance the properties of low-density wood but emit higher formaldehyde. Incorporation of nanoparticle to the phenolic matrix could possibly reduce the use of high concentration LmwPF and thus lower the formaldehyde emission (FE) without adversely affecting the other properties. The aim of the study was to examine the characteristics of LmwPF resin and nanoclay admixture and determine its effects on the performance of *impreg* wood. Montmorillonite nanoclay nanomer (0.5–1.5 % w/w based on solid PF) was dispersed in LmwPF resin (10–20 % w/v) using ultrasonication technique. The dispersion of nanoclay in LmwPF was examined using X-ray diffraction (XRD) analysis and transmission electron microscopy (TEM). XRD and TEM analyses confirmed that the nanoclay dispersion in the resin was in exfoliated form. Air-dried sesenduk (*Endospermum diadenum*) wood was impregnated with these admixtures using vacuum pressure process followed by curing at 150 °C for 30 min. The FE, dimensional stability and strength properties were evaluated and compared with *impreg* wood treated solely with LmwPF. The results showed that the polymer retention and density of the LmwPF/nanoclay-impregnated samples were higher than the LmwPF-impregnated samples. This admixture had successfully bulked the cell wall of the wood and imparted higher dimensional stability to the treated wood. The modulus of rupture and modulus of elasticity, compressive stress and hardness of the LmwPF/nanoclay *impreg* were more superior compared to the LmwPF *impreg*. The admixture was also found to be able to reduce the FE compared to LmwPF resin.

**Keyword:** Phenolic resin; Nanoclay admixture; Impreg wood