

Resistance improvement of rubberwood treated with zinc oxide nanoparticles and phenolic resin against white-rot fungi, *Pycnoporus sanguineus*

ABSTRACT

Phenolic resin or phenol formaldehyde (PF) resin containing different percentage of zinc oxide (ZnO) nanoparticles was prepared and used to treat rubberwood. Three types of treatment solutions were prepared, namely (1) low molecular weight phenol formaldehyde resin (LMwPF), (2) 1,5 wt % nano ZnO dissolved in water (ZnO/H₂O), and (3) combination of both LMwPF and 1,5 wt % nano ZnO (LMwPF/ZnO). The rubberwood samples were submerged into the treatment solutions for 60, 90, and 120 min, before vacuum impregnation. The untreated rubberwood samples served as the controlled samples. The thermal stability behaviour and resistance against white-rot fungi (*Pycnoporus sanguineus*) of the treated rubberwood samples were evaluated. The results reveal that the treated rubberwood had slightly better thermal stability compared to the untreated samples. In terms of decay resistance, the rubberwood treated with LMwPF and LMwPF/ZnO possess very high resistance against white-rot fungi. On the other hand, the rubberwood treated with ZnO/H₂O did not attain similar effectiveness as the other two treatments, except for the samples that were submerged in ZnO/H₂O for 120 min. The results indicate that 1,5 wt % nano ZnO could be sufficient in imparting superior durability to rubberwood provided that longer submersion time is adopted.

Keyword: Fungal resistance; *Hevea brasiliensis*; Impregnation modification; Phenol formaldehyde resin; Thermal stability