

Novel natural rubber latex/lignin-based bio-adhesive: synthesis and its application on medium density fiber-board

Jayshree Thuraisingam¹ · Puranjan Mishra² · Arun Gupta¹ · Triveni Soubam¹ · Bijarami Mat Piah¹

¹Faculty of Chemical and Natural Resource Engineering, University Malaysia Pahang, Gambang Campus, 26300 Kuantan, Malaysia

²Faculty of Engineering Technology, Universiti Malaysia Pahang, Lebuhraya Tun Razak, Gambang, 26300 Kuantan, Pahang, Malaysia

ABSTRACT

The phenolic content in lignin makes it a potential substitute for formaldehyde-based synthetic wood adhesives. In the present work, lignin isolated from *Hevea brasiliensis* was treated with laccase enzyme to obtain active lignin. The activated lignin (NaOH treated) was further formulated with natural rubber latex (NR-latex) to prepare bio-adhesive. Complementary analysis such as modulus of rupture (MoR), modulus of elasticity (MoE), internal bonding (IB), Fourier transform infrared (FTIR) spectroscopy, thickness swelling (TS), and scanning electron microscopy (SEM) were applied to characterize a medium density fibre-board (MDF) prepared based on bio-adhesive formulation. It was found that bio-adhesive formulation of 10 g NR-latex with 10 g of lignin has the highest MoR of 16 MPa, while the formulation of 15 g NR-latex with 5 g lignin showed the highest MoE of 15 MPa. The TS result showed that there is a weight gain on MDFs with a lower proportion of NR-latex content which consequently increases the density of the composites. The FTIR analysis of formulated bio-adhesive revealed the significant difference in chemical composition with different proportions of lignin and NR-latex in bio-adhesive. Finally, SEM examination of the interfaces of formulated bio-adhesive and wood fibre material showed the better dispersion with no adhesive lumps.

KEYWORDS: Bio-adhesive, Lignin, Natural rubber latex, Medium density fibre-board, Bending strength, Internal bonding, Synthetic-adhesive

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