SYNTHESIS OF ALKALINE MODIFIED RICE STARCH – NATURAL RUBBER LATEX (NRL) AS AN BIO-ADHESIVE FOR WOOD COMPOSITE BONDING

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Abstract:
The over-exploitation of synthetic adhesives in wood composite manufacturing industries has become a major threat to environment and consumers health due to its carcinogenic formaldehyde emissions. Hence the present study has been focused towards the development and application of bio-adhesive as an alternative to replace synthetic adhesives. Rice starch (RS) is used as fillers and incorporated into natural rubber latex (NRL) by blending technique. Prior to blending, RS was subjected to chemical modification using sodium hydroxide (NaOH). Alkaline hydrolysis of 2M NaOH for 60 minutes at 45°C produce modified RS with the best working shear strength of 0.38MPa and 0.43MPa respectively. Alkali modified RS was blended with NRL in weight content of 0%,25%,50%,75% and 100% accordingly. Consequently, all formulations were applied for medium density fibreboard (MDF) manufacturing via hot pressing at 180°C for 4 minutes and the samples were subjected to mechanical testing such as modulus of rupture (MOR), internal bonding(IB) and thickness swelling(TS). The thermal stability was analyzed through thermogravimetric analysis (TGA). Based on the mechanical testing it indicates that bio-adhesive formulation that contain the highest weight content of alkali modified RS shows outstanding MOR of 26.4MPa and 36.7MPa while IB of 0.39MPa and 0.66MPa which indicate alkali modified RS - NRL exhibit significant mechanical adhesive performances. Moreover, thermal analysis proved that RS content by weight of 75% bio-adhesive formulation has higher temperature of weight loss, indicating that incorporation of RS enhances the thermal oxidative stability of bio-adhesive. The research proved that alkaline modified RS can be viable filler to reinforce the adhesion properties of natural rubber matrix.

Keywords: Alkaline modified rice starch, Natural rubber latex, Bio-adhesive, Mechanical strength, Medium density fibreboard.

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