

Effect of the filler materials in urea formaldehyde adhesives used in wood composite manufacturing industry

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This research examines the effect of filler materials on urea formaldehyde (UF) adhesives used in the wood composite manufacturing industry. The study compares the performance of wheat flour, a commonly used but expensive filler, with coal fly ash and wood fly ash, waste products with adverse environmental impacts. The objectives include evaluating the impact of coal fly ash and wood fly ash fillers on adhesive viscosity and the mechanical properties (bending strength and modulus of elasticity) of wood composites and comparing the results with wheat flour. Viscosity measurements conducted with a Brookfield viscosity meter indicate a significant increase in UF adhesive viscosity over time with the addition of wheat flour. Wood fly ash shows minimal impact on viscosity, while coal fly ash contributes moderately compared to wheat flour and wood fly ash. Bending tests (ASTM D790) and empirical equations, following EN-325 sampling standards, are employed to assess the effect of filler materials and concentration on bending strength and modulus of elasticity in the final wood composites. Plywood bonded with coal fly ash demonstrates the highest bending strength and modulus of elasticity, with wheat flour as the reference filler. Both wheat flour and coal fly ash exhibit improved bending strength with increasing filler concentration, while wood fly ash exhibits the opposite effect. In conclusion, coal fly ash proves to be a suitable substitute for wheat flour as a filler in urea formaldehyde adhesives, providing satisfactory adhesive properties and enhancing the performance of wood composites.

Keywords: Urea formaldehyde adhesive, filler materials, viscosity, bending strength, modulus of elasticity