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Multi-scale evaluation of the effects of nanoclay on the mechanical properties of wood/phenol formaldehyde bondlines

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Abstract

Nanoclay is a natural mineral that has great potential as a reinforcing filler in wood adhesives. In order to investigate the reinforcing mechanism more clearly, the crystalline structure, chemical properties, morphology, and thermal stability of pure PF and organic nanoclay-reinforced phenol formaldehyde (PF-OMMT) adhesive were characterized. The comparative mechanical properties of pure PF adhesive and PF-OMMT in the bondlines of plywood were analyzed by nanoindentation (NI) under different service environments and the shear strain distribution on the interphase was also measured by a digital image correction technique (DIC). X-ray diffraction (XRD), Fourier transform infrared (FTIR) and transmission electron microscopy (TEM) results indicated good dispersion of the clay in the PF matrix. The modified adhesive showed greater thermal stability than did the control adhesive, as evaluated

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