

عنوان مقاله:

Development of Nano-Clay Reinforced Thermoplastic Adhesives for Wood Joints

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نویسندگان:

Alireza Kaboorani - Faculty of Forestry, Geography and Geomatics, Laval University, ۲۴۲۵, rue de la Terrasse,
Québec, QC, G1V ۰A۶, Canada

Bernard

خلاصه مقاله:

Nanotechnology has been finding applications in many industrial sectors and adhesive industry is a field where this new technology may be useful. In this study, nanotechnology was used to develop a new generation of thermoplastic adhesives with improved adhesion strength and performance. Polyvinyl acetate (PVA), a thermoplastic polymer, has poor performance at elevated temperatures and humid conditions as a wood adhesive. Two types of hydrophilic nano-clays were mixed at different loadings (1, 2 and 4%) with PVA to determine any increase in the performance of PVA towards water and elevated temperatures. The properties of PVA-clay nanocomposites as wood adhesives were characterized by measuring the shear strength of wood blocks bonded with these modified adhesives in dry and wet conditions, and also at elevated temperatures. Thermal stability and structure of the PVA-clay nanocomposites were studied by thermogravimetric analysis, X-ray diffraction and transmission electron microscopy. The results show that shear strength of wood joints increased in all conditions following addition of nano-clay to PVA. The extent of increase varied according to nano-clay loading and type. Inclusion of nano-clay improved the thermal stability of PVA at different degrees depending on nano-clay loading and type. The morphological studies revealed that the fluctuations observed in thermal stability and adhesion strength of the nanocomposites stem from dispersion quality of nano-clay. Exfoliated structures, achieved at low loading 1 and 2%, improved properties of nano-composites. A high loading of nano-clay (4%) led to a structure where exfoliated and intercalated structures coexisted. Such coexistence lowered the performance increase achieved by nano-clay addition.

کلمات کلیدی:

Polyvinyl acetate (PVA), nano-clay, adhesion strength, wood joints, elevated temperature, thermal stability, exfoliated and intercalated structures

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