

Effects of the improvement in thermal conductivity coefficient by nano-wollastonite on physical and mechanical properties in medium-density fiberboard (MDF)

Abstract

The improving effect of an increase in the thermal conductivity caused by nano-wollastonite (NW) on the physical and mechanical properties of medium-density fiberboard (MDF) was studied. Nanowollastonite was applied at 2, 4, 6, and 8 g/kg, based on the dry weight of wood-chips, and compared with control specimens. The size range of wollastonite nanofibers was 30 to 110 nm. The results show that NW significantly ($p < 0.05$) increased thermal conductivity. The increased thermal conductivity resulted in a better curing of the resin; consequently, mechanical properties were improved significantly. Furthermore, the formation of bonds between wood fibers and wollastonite contributed to fortifying the MDF. It was concluded that a NW content of 2 g/kg did not significantly improve the overall properties and therefore cannot be recommended to industry. Because the properties of NW-6 and NW-8 were significantly similar, a NW-content of 6 g/kg can be recommended to industry to significantly ($p < 0.05$) improve the properties of MDF panels.

Keyword: Minerals; Nanotechnology; Particleboard; Thermal conductivity coefficient; Wollastonite; Wood composite