

Water repellent effect and dimension stability of beech wood impregnated with nano-zinc oxide

ABSTRACT

The objective of this study was to quantify the influence of zinc oxide nanoparticles (nano-ZnO) on the water repellency and dimensional stability of beech wood. Beech wood blocks were treated with a nano-ZnO solution at four treatment levels (0, 10,000, 20,000, and 40,000 ppm) using a modified dip method. Also, a thermal treatment was performed at 60 and 120°C. After conditioning the samples, water absorption, volumetric swelling, water repellency effectiveness, and anti-shrink/anti-swell efficiency were determined within 24 h of soaking time. The results indicated that the nano-ZnO used for wood modification greatly improved dimensional stability and reduced the hygroscopicity of the wood. In addition, the Fourier-transform infrared spectroscopy (FTIR) analysis suggested a strong interaction between the nano-ZnO and the chemical components of wood. The heat treatment effectively improved the effects of nano-ZnO.

Keyword: Anti-swell efficiency; Beech wood; FTIR; Nano-zinc oxide; Water repellency effectiveness