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Soy-oil-based waterborne polyurethane improved wet strength of soy protein adhesives on wood

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Abstract

Soy-oil-based waterborne polyurethane (WPU) is used to improve wet strength in shear test of wood bonded with an adhesive of soy protein isolate (SPI) by dispersing WPU into SPI slurry. WPU's effects on the physiochemical properties of WPU-SPI adhesives are characterized through Fourier transform infrared spectrum, transmission electron microscopy, thermal analysis, contact angle, and mechanical strength. Wet strength of the WPU-SPI adhesives increases by 65% compared to SPI control. Moreover, the microstructure of WPU has effects on the interactions between WPU and SPI. In this study, smaller and more uniform distributed WPU0002 is easier to interact and form stronger crosslinking network with protein than WPU0500. The stronger interaction between WPU0002 and protein results in increased viscosity and bond strength. The WPU-SPI blended adhesives show significantly improved wet strength, demonstrating their potential as wood adhesives.

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