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Thermal treatment of soybean protein and its effects on the water resistance of soybean protein adhesive

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Soy protein isolate is an abundant and renewable industrial crop product that can be an environmental friendly and sustainable alternative to petrochemicals for producing wood adhesives by eliminating its inherent defects such as poor water resistance. In this study, a novel method to improve water resistance of soybean protein was proposed by the thermal treatment in the presence of Na_2SO_3 and SDS; based on investigations of the effects of thermal treatment temperature, Na_2SO_3, SDS and their combination on the water resistance of protein using FTIR, XRD, TGA and SEM. Partial soybean protein formed stable three-dimensional network during the thermal treatment via the re-polymerization and the rearrangement of soybean protein molecules, which improved the water resistance of soybean protein as confirmed by the increased water insoluble content and hydrothermal-aged wet bond strength. Attributing to the capacities of Na_2SO_3 to cleave disulfide bonds and SDS to destroy the hydrophobic interactions of proteins, their combination during thermal treatment released the active groups buried within the globular structure of soybean protein via partial unfolding. This not only further promotes the re-polymerizations of soybean protein molecules but also yield more active sites for crosslinking by post-added crosslinker. This resulted in higher water insoluble content and hydrothermal-aged bond strength compared with the thermal treated soybean protein without Na_2SO_3 and SDS. The optimal levels of Na_2SO_3 and SDS during thermal treatment were all 1 wt%, producing a modified soybean protein with the best water resistance that can be used to prepare a wood adhesive for structural-use plywood according to JIS K6806-2003 commercial standard.

Biography

Zhen Hua Gao completed his PhD from Northeast Forestry University and Post-doctoral studies from Wood Composite Department of Forintek Canada Corp in Canada. He is a Professor at College of Material Science and Engineering, Northeast Forestry University in China. He has published more than 40 papers in reputed journals. One article published in *Pigment & Resin Technology* has been chosen as an Outstanding Paper at the Literati Network Awards for Excellence 2008. His five invention patents were authorized. He has finished more than 10 projects as leader so far.

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