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# Modification of urea-formaldehyde resin adhesives with blocked isocyanates using sodium bisulfite

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## Abstract

Polymeric 4-4 diphenyl methane diisocyanate (pMDI) was blocked with an aqueous sodium bisulfite solution to obtain water-dispersible blocked pMDI (B-pMDI) resin with different HSO<sub>3</sub>/-NCO mole ratios for the modification of urea-formaldehyde (UF) resin. Fourier transform infrared (FTIR) spectra of the B-pMDI resin clearly showed that all isocyanate groups of the pMDI resin were successfully blocked by sodium bisulfite. As the HSO<sub>3</sub>/-NCO mole ratio increased, the de-blocking temperature of the B-pMDI resin also increased. Two addition levels (1 and 3%) of the B-pMDI resin with different HSO<sub>3</sub>/-NCO mole ratios were mixed with UF resins and used as an adhesive for plywood. The gel time of the UF/B-pMDI resins decreased to a minimum at a mole ratio of 0.9 and then increased with the HSO<sub>3</sub>/-NCO mole ratio, and was consistent with the peak temperature ( $T_p$ ). However, as the HSO<sub>3</sub>/-NCO mole ratio increased, the viscosity of the modified UF resins by 1% B-pMDI resin addition slightly increased, whereas those of modified resins with 3% B-pMDI resin addition rapidly increased. The adhesion strengths of plywood bonded with the hybrid resins were greater for 1% B-pMDI resin addition than for 3% B-pMDI resin addition. Formaldehyde emission of

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