

Formulation of an environmentally friendly adhesive for wood

Abstract

Malaysia has over 4 million hectares of oil palm plantations that yield large amounts of empty fruit bunches (EFB) generated from palm oil milling operations. These forms of lignocellulosic residue pose an environmental hazard if their disposal is not managed in a systematic manner. One of the useful elements extracted from these EFBs is lignin. The general purpose of this study is to explore the potential uses of lignin extracted from soda black liquor (paper and pulping waste) derived from oil palm empty fruit bunches (EFB) in the formulation of a more environmentally friendly wood adhesive. In this work, the potential for replacing phenol with lignin in phenol formaldehyde resin formulation is examined. The quantity of phenol was reduced by synthesizing the resin at a lignin to phenol ratio of 1:1. The physical and chemical properties of lignin phenol formaldehyde resin (LPF) and commercial phenol formaldehyde resin (CPF) were then compared. The infrared spectrum revealed similarities in the functional groups of both LPF and CPF resins. Tensile strength comparisons between both resins revealed that the LPF resin had a higher bonding strength (11.60 MPa more in term of allowable maximum load). In addition, the kinematics viscosity test showed that the LPF resin had lower kinematic viscosity than the CPF resin after 21 days of storage. Finally, the scanning electron microscope images for both resins showed similarities in terms of penetration into wood vessels.