Effects of Compression Ratio and Phenolic Resin Concentration on the Properties of Laminated Compreg Inner Oil Palm and Sesenduk Wood Composites

ABSTRACT

Due to its inferior properties, oil palm wood (OPW) extracted from the inner layer of the oil palm (Elaeis guineensis) trunk, referred as inner OPW in this study, is frequently regarded as a waste. Phenolic resin treatment and lamination of inner OPW with other hardwoods may be an excellent way to improve the properties of the inner OPW. In this study, inner OPW were treated with two different concentrations (15% and 20%) of low molecular weight phenol formaldehyde resin (LmwPF) and compressed at different compression ratios (10%, 20%, and 30%). The physical and mechanical properties of the modified inner OPW's were evaluated according to British Standards (BS) 373: 1957. The results revealed that inner OPW treated with the highest compression ratio (30%) and resin concentration (20%) exhibited the highest weight percent gain, polymer retention and density. In the following phase of the research, the treated inner OPW was used as the core layer in the fabrication of a three-layer laminated compreg hybrid composites, with untreated and treated sesenduk (Endospermum diadenum) wood serving as the face and back layers. The compression ratios of 10% and 20% and resin concentrations of 10% and 20% were used in this phase of study as laminated boards made with 30% compression ratio failed. The findings showed that resin concentration had a significant impact on both the inner OPW and the laminated compreg hybrid panels. Markedly, higher resin concentrations (20%) resulted in improved physical properties, i.e., thickness swelling and water absorption, as well as enhanced mechanical properties (modulus of rupture and modulus of elasticity). Although compression ratios had no significant effect on the properties of the laminated products, those compressed at higher compression ratios (20%) performed slightly better than the panels compressed at lower compression ratios (10%).