Response surface methodology models of processing parameters for high performance phenolic compreg wood

ABSTRACT

The aim of the study was to develop response surface methodology (RSM) models for polymer loading, density, dimensional stability, strength and stiffness of compressed wood of sesenduk (Endospermum diadenum) treated with phenol formaldehyde (PF). Central composite design (CCD) using RSM with three processing parameters was studied in their specific ranges: PF concentration (PC) from 24-40%, pre-curing time (PCT), 3-9 h and compression ratio (CR), 70-90%. The experimental design was analysed and interpreted using the Design Expert Software (Stat Ease version 8) and the responses of 3d plots were built using the same software. Quadratic models in terms of PC, PCT and CR were developed for polymer loading, density, reduction in water absorption and modulus of rupture in static bending. Multiple linear equations were developed for anti-swelling efficiency and modulus of elasticity. The experimental values were in good agreement with predicted ones and the models were highly significant with correlation coefficients between 0.626 and 0.926. PC and CR had significant effects on the responses. The range of PCT used did not significantly affect the responses. It was also found that the improvement of properties ranged from moderately to highly correlated with the polymer loading in the compreg wood.

Keyword: Central composite design; Compreg; Phenol formaldehyde