

Fire-retardant property of hexasubstituted cyclotriphosphazene derivatives with Schiff base linking unit applied as an additives in polyurethane coating for wood fabrication

ABSTRACT

A series of new hexasubstituted cyclotriphosphazene derivatives containing Schiff base linkages were successfully synthesized and characterized. The series contains different terminal substituents of pentyl and tetradecyl. Fourier transform infrared spectroscopy (FTIR), nuclear magnetic resonance spectroscopy (NMR), and carbon, hydrogen, and nitrogen (CHN) elemental analysis were used to characterize the intermediates and final compounds, while the thermal stability of the final compounds is evaluated with a thermogravimetric analysis (TGA) test. The final compounds are physically added to the polyurethane coating formulation and then applied to the wood panel using a brush and the compound's fire-retardant properties are evaluated using the limiting oxygen index (LOI) test. In this research, compound 3b showed good thermal stability compared to compound 3a. In terms of LOI results, polyurethane with an LOI value of 21.90% was employed as a matrix for wood coating and the value increased to 24.90% when this polyurethane is incorporated with 1 wt.% of the compound 3b. The increase in the LOI value indicates that the wood coating containing hexasubstituted cyclotriphosphazene compounds exhibits excellent fire-retardant properties as additives.