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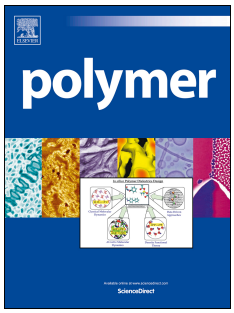

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Influence of metal ions on thermo-oxidative stability and combustion response of polyamide 6/clay nanocomposites.

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ABSTRACT:

Combustion and thermo-oxidative properties of polyamide 6 (PA6)/montmorillonite (MMT) clay nanocomposites are studied with emphasis on the catalytic role of metal ions (Mg^{2+}, Al^{3+} and Fe^{3+}) present in MMT. Each metal ion uniquely influences condensed phase reactions (mechanism and/or kinetics) depending on its concentration in metal ion exchanged MMT, its ability to form metal-organic complexes, and confinement effect as determined by eventual dispersion of MMT in the matrix. Presence of Al^{3+} accelerated kinetics of PA6 decomposition during initial stages, Mg^{2+} rich composite displayed good thermo-oxidation stability and char yield, and Fe^{3+} prominently altered the chemical composition of condensed phase ultimately producing highest amount of smoke. Possible PA6 decomposition reaction mechanisms have been identified that are susceptible to metal ion catalysis in the presence of oxygen. These results provide important progress towards the understanding of widely reported yet poorly understood phenomena of catalyzing effect of clay during the combustion of polymer. The results are a