



**MARY KAY O'CONNOR
PROCESS SAFETY CENTER**
TEXAS A&M ENGINEERING EXPERIMENT STATION

20th Annual International Symposium
October 24-26, 2017 • College Station, Texas

Review: Overview of flame retardant additives, mechanism of flame retardancy and characterization techniques for polymer nanocomposites

Lubna Ahmed, Logan Hatanaka, Bin Zhang, M. Sam Mannan*

Mary Kay O'Connor Process Safety Center, Artie McFerrin Department of Chemical Engineering, Texas A&M University

*Corresponding author: M. Sam Mannan, Tel: +1 (979) 862-3985, E-mail: mannan@tamu.edu

Abstract

Fire retardancy of plastics is becoming increasingly important due to the widespread application of plastics in daily life and the subsequent fire hazard associated with it. A wide variety of flame retardant additives have been historically used; however, many of them have been restricted due to toxicity, lack of thermal stability performance *etc.* This study provides a current state-of-the-art review on flame retardant additives that can be employed in polymers for better fire performance. The article also describes the hazards associated with burning of polymers, characteristic flame retardant properties of nanocomposites and material characterization methods applied for determining their efficiency. Further, we present a fundamental understanding of the flame retardancy of polymers, through the synergistic interaction among the nanofillers: ones that cause a physical barrier effect and the others that cause catalytic charring effect in the condensed phase, by studying the kinetics and the mass and heat transfer processes during pyrolysis.

Keywords: *Polymer nanocomposites, flame retardancy, characterization*