Biocatalytic Synthesis of Environmentally Safe Flame-Retardant Polymers

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Research in the area of flame-retardant (FR) materials is of growing interest due to their innumerable applications in fire safe clothing, housing, aviation and telecommunications. Halogen based FR polymers, until recently were a cost effective solution to FR materials, but are now banned due to the release of toxic gases upon combustion. Thus, there exists the need to develop environmentally-safe, economical and processable polymers with efficient FR properties. Biocatalytic synthesis of polymers is of great importance in making functional materials using environmentally benign conditions. We have recently shown that biocatalytically synthesized siloxane based copolymers have great potential as FR materials. In this paper, we present the simple biocatalytic synthesis, characterization, thermal and flame retardant properties of novel siloxane-aryl copolymers and compare them with well known FR polymers. We also present TiO_2 nanocomposites of these polymers which showed improved FR properties.