

Chloral Based Polymers

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Research Objective: To synthesize and characterize chlorinated thermoplastics for use as materials in aircraft interiors.

Approach: There are many polymers that are considered to be nonflammable but few of them meet the stringent requirements set by the FAA for aircraft materials. Those that do meet the requirements are typically very expensive and difficult to process. In the past, chloral based polymers (specifically Bisphenol C derivatives) have been reported to be self-extinguishing materials. Polycarbonates derived from Bisphenol C are thermoplastic materials with properties very similar to those of Bisphenol A polycarbonate except for the enhanced resistance to fire. Bisphenol C is a relatively cheap monomer obtained in a two step synthesis starting with phenol and chloral followed by dehydrohalogenation. Incorporation of Bisphenol C or similar chloral based monomers into polymers could lead to materials with improved fire resistance and desirable mechanical and processing properties.

Accomplishment Description: Polyarylates were prepared by an interfacial polymerization of Bisphenol C with a mixture of terephthalic and isophthalic acid chlorides. Thermogravimetric analysis has shown that these materials have high char yields (greater than 50 wt% at 700°C). Initial results from microcalorimetry experiments on polyarylates derived from Bisphenol C confirm the nonflammable characteristics of these materials. Peak heat release capacity was found to be around 15 J/g-K for the Bisphenol C polyarylate. These results have led to the synthesis of other Bisphenol C based polymers that have similar properties.

Significance: The ability to prepare materials from relatively inexpensive monomers and processes that are melt processible is very important in finding new materials for aircraft interiors.

Expected Results: Other polymers derived from Bisphenol C and similar monomers are expected to show the improved fire resistance. The optimal properties with respect to fire resistance, mechanical properties, thermal properties and processing conditions will have to be determined. Properties necessary will depend on the specific application and the properties will be determined by the polymer material.

References: Rusanov, A.L.; "Condensation Polymers Based on Chloral and Its Derivatives", Progress in Polymer Science 1994, 19, 589-662.

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