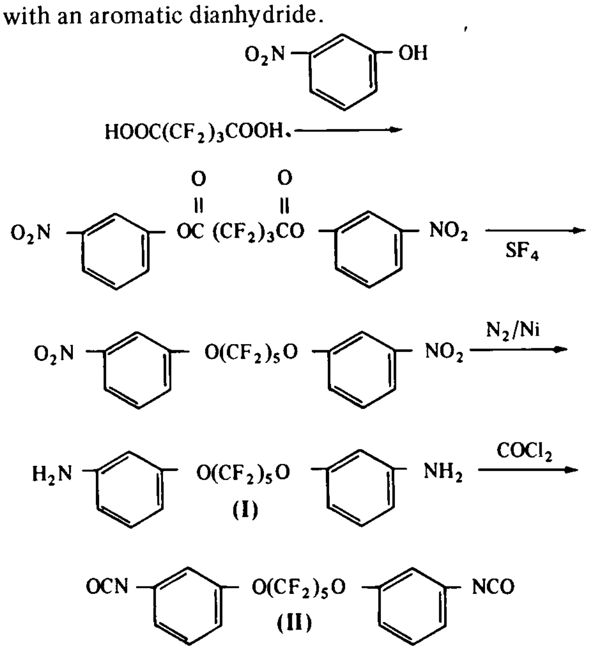
NASA TECH BRIEF
Marshall Space Flight Center

Thermally Resistant Polymers for Fuel Tank Sealants

As part of the search for thermally resistant fuel tank sealants, much effort has been directed toward the development of fluorocarbon and silicone polymers. In a study describing such investigations, the major effort was in the development of isocyanurate-linked fluorocarbon polymers. It was shown that a fluorocarbon dicarboxylic acid can be converted to intermediates whose terminal functional groups permit polymerization. In the reaction example below, intermediate I can be converted to a polyisocyanurate by catalysis, and intermediate II can be converted to a polyimide by reaction with an aromatic dianhydride.



The polymers formed show resistance to jet fuel at 560K and have promising thermal stability; they serve as good prototypes for the synthesis of polymers from larger fluorocarbon acids.

The stability and fuel resistance of these prototypes suggests lengthening the chain segment by incorporating a perfluoroalkylene ether segment into a stable polymer. Several synthesis routes were investigated. The basic method was to convert the fluorocarbon dicarboxylic acid to an aromatic diketone followed by nitration and conversion to isocyanurate. Although more work is being done, these results already show that a high stability linkage may be established between a fluorocarbon chain segment and a reactive functional group. This linkage in difunctional compounds leads to the formation of useful polycyanurate and polyimide polymers.

Note:

Requests for further information may be directed to:

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No patent action is contemplated by NASA.

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