NASA TECH BRIEF

Synthesis of Polyethers of Hexafluorobenzene and Hexafluoropentanediol

New polymers, (1) a polyether, identified as poly (hexafluoropentamethylene tetrafluoro-p-phenylene ether), and (2) a completely hydroxyl-terminated polyether have been prepared.

The polyether (1) was prepared by reaction of hexafluorobenzene with hexafluoropentanediol and an alkali metal hydroxide or by reaction of hexafluorobenzene with an alkali metal salt of hexafluoropentanediol. The reactions can be conducted either in the absence of a solvent or with a solvent such as N,N-dimethylformamide, tetrahydrofuran, or diethyl ether. If either of the latter two compounds is used as solvent, a basic catalyst such as N, N-dimethylformamide or pyridine must be used. Polyethers of this type can be prepared in which all terminal groups are pentafluorobenzene groups, 5-hydroxy-hexafluoropentoxy groups, or a mixture of the two. The polyethers can be prepared as low molecular weight oils, as intermediate molecular weight waxes, or as high molecular weight elastomers. The oils and the waxes can be used to prepare polyurethanes by reaction with diisocyanates. The highly fluorinated polyurethanes prepared from these polyethers and fluoroaromatic diisocyanates possess substantially improved chemical and fire resistance. The high molecular weight polyether elastomers also exhibit a high degree of chemical and fire resistance.

The completely hydroxyl-terminated polyethers (2) are prepared in a one-step process by reacting hexafluorobenzene with hexafluropentanediol and potassium hydroxide using copper iodide as a catalyst. The reaction is carried out in an inert solvent such as tetrahydrofuran, dioxane, or ether. The preferred solvent is tetrahydrofuran.

Polyethers of these types, (1) and (2), can be prepared to contain various proportions of fluorine and/or the other halogens.

Note:

Requests for further information may be directed to:

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Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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