View metadata, citation and similar papers at core.ac.uk

July 1970

brought to you by TCORE

Brief 70-10131

NASA TECH BRIEF



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Division, NASA, Code UT, Washington, D.C. 20546.

Polymerization of Perfluorobutadiene

A new polymer form of perfluorobutadiene and a new method of production has been developed. Previous methods required extremely high pressures, on the order of 10^4 atmospheres, which placed severe limitations on the equipment, besides increasing haziards and production costs.

The polyperfluorobutadiene obtained by this method has good chemical resistance and can be used where hard elastomers are required. It can also serve as a prepolymer to form high molecular weight material with excellent temperature and other properties.

In the new method, diisopropyl peroxydicarbonate is used as a catalyst to initiate the polymerization of polyperfluorobutadiene. The peroxydicarbonate is dissolved directly in the liquid perfluorobutadiene and the reaction conducted in a sealed vessel at the autogenous pressure of polymerization. The reaction temperature, the ratio of catalyst to monomer, and the amount of agitation determine the degree of polymerization and product yield. With increased temperature (up to about 50°C) or amount of catalyst, the molecular weight of the polymer tends to decrease, while the yield tends to increase.

Analysis of the polyperfluorobutadiene indicates that it is a copolymer of perfluoro-1, 2- and 1, 4-butadiene. It has the advantage of two types of double bonds (terminal and internal) which are easily susceptible to cross-linking reactions and graft copolymerizations. One advantage of diisopropyl peroxydicarbonate as a catalyst is that it is miscible with the perfluorobutadiene monomer. At least 0.10 weight percent of the catalyst is needed to obtain polymerization. Because it decomposes at 5°C, the solid catalyst is placed into a precooled pressure vessel which is attached to a vacuum line and evacuated. The vessel is further cooled in a liquid nitrogen or dry-ice/acetone bath and perfluorobutadiene is condensed into it. The vessel is then sealed and the materials mixed continuously during the reaction period, which can last from 24 hours to several weeks.

Note:

Requests for further information may be directed to: Technology Utilization Officer NASA Pasadena Office 4800 Oak Grove Drive Pasadena, California 91103 Reference: B70-10131

Patent status:

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

> Source: M. Toy and J. Newman of McDonnell Douglas Corporation under contract to NASA Pasadena Office (NPO-10863)

> > Category 04

This document was prepared under the sponsorship of the National Aeronautics and Space Administration. Neither the United States Government nor any person acting on behalf of the United States Government assumes any liability resulting from the use of the information contained in this document, or warrants that such use will be free from privately owned rights.