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

. September 1975

brought to you by **CORE** provided by NASA Technical Reports Server

B/S-10207



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 National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

NASA TECH BRIEF

NASA Pasadena Office

Liquid Ethylene-Propylene Copolymers

A new class of oligomers has been produced by thermally degrading commercially-available ethylenepropylene rubber (EPR). It has been found that EPR does not melt when subjected to elevated temperatures, but rather it partially degrades to liquid oligomers. The molecular weight and the viscosity of these liquids can be predetermined by the process temperature.

One advantage of the oligomeric ethylenepropylene copolymers is their low viscosity for a given molecular weight, as compared to analogous oligomeric poly(isobutylene). This makes them easier to use in processing. In addition, the ethylene-propylene copolymers contain an olefinic unsaturation of approximately 2 equivalents/mole. This feature facilitates their use as precursors to hydroxyl prepolymers capable of curing to elastomers by the use of standard methods.

The new oligomers are prepared by heating solid EPR in a container that retains the solid and permits the liquid product to flow out as it is formed. In a typical experimental procedure, a Vycor tube 2.5 cm in diameter and 50 cm long is fitted in the cover of a 500-ml resin kettle. A loose-fitting disk-shaped plug is held in the tube by a constriction, located about 9 cm from the bottom of the tube, and the tube is filled with borosilicate Raschig rings to approximately 13 cm above the disk. A condenser connects the top of the tube to a collecting flask.

Small pieces of EPR are introduced into the Vycor tube, and a tube furnace is used to heat them to 350° C. A nitrogen counterflow is introduced into the resin kettle, up the tube, and out of the condenser. As the degradation proceeds, liquid oligomer is collected in

the resin kettle, solid EPR remains in the tube, and volatile byproducts are carried out through the condenser to the collecting flask.

With an EPR sample of 210 g, the yield is 179 g (84.7 percent) of oligomer and 20 g of volatile product. Alternate experimental procedures have been used with temperatures up to 600° C; the best yield was 92.8 percent at 430° C. Oligomer molecular weights achieved varied from around 1,400 to 8,300, and unsaturation varied from 1.62 to 2.52 equivalents/mole, both depending upon the experimental conditions.

Note:

Requests for further information may be directed to:

Technology Utilization Officer NASA Pasadena Office 4800 Oak Grove Drive Pasadena, California 91103 Reference: TSP75-10207

Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

> Patent Counsel NASA Pasadena Office 4800 Oak Grove Drive Pasadena, California 91103

> > Source: Robert A. Rhein, John D. Ingham, and Marshall F. Humphrey of Caltech/JPL (NPO-13555)

Category: 04 (Materials)

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.

응답한 집을 입장된다. 실망소감

i degrafi i strati i Nutatio i Nationali