

February 1966

Brief 66-10043

NASA TECH BRIEF



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Polymer Film Exhibits Thermal and Radiation Stability

The problem:

In the pursuit of aerospace programs there is a growing need for polymeric materials having the ability to absorb large quantities of photolytic, thermal, and radiolytic energies while retaining their useful properties. Dielectrics within a capacitor in a field of ionizing radiation, for example, are of significant concern because of the possibility of radiation-induced charging or partial charging that would seriously interfere with design performance. Polymers with the above characteristics could appreciably advance the art in many terrestrial applications.

The solution:

A new class of aromatic/heterocyclic polymers (called Pyrrones) prepared from the room temperature reaction of tetraamines with tetraacids. Chemically and physically they combine many of the desirable properties of the aromatic polyimides and polybenzimidazoles.

How it's done:

A solution of 4.36 g. (0.020 mole) of sublimed pyromellitic dianhydride in 42 ml. of dimethylformamide (DMF) is added to a rapidly-stirred solution of 4.60 g. (0.020 mole) of 3,3',4,4'-tetraaminodiphenyl ether in 35 ml. of DMF. The resulting viscous solution is cast onto glass plates and the solvent is evaporated at 85°C for one hour, leaving a self-supporting film that is then heated for one hour at 200 to 250°C. The heat

treatment leaves a deep red, self-supporting, flexible film that is highly resistant to heat.

Notes:

1. While potential applications of the Pyrrones are relatively unexplored, they hold much promise as high temperature films, coatings, adhesives, resins for laminates, and in filament winding.
2. Moldings of the Pyrrones are adaptable to easy filling with conventional reinforcing materials and exhibit very hard surfaces with a high degree of machinability.
3. The full characterization of this new class of polymers is far from complete and intensive research is continuing toward better understanding.
4. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Langley Research Center
Langley Station
Hampton, Virginia, 23365
Reference: B66-10043

Patent status:

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

Source: Vernon L. Bell, Jr.
(LRC-100)

Category 03