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NASA TECH BRIEF

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Adhesives for Laminating Polyimide Insulated Flat Conductor Cable

The problem:

To develop an effective adhesive for laminating polyimide-film flat conductor cable. The adhesive must be capable of bonding polyimide film to polyimide film as well as to copper. It must remain thermally stable over the operating range of the polyimide film and meet other rigorous physical and chemical requirements. This film is a commercially available plastic which has found extensive use as electrical coaxial cable insulation at temperatures of up to at least 300°C. The wrapping techniques used for coaxial cable are unsuitable for flat strip conductors.

The solution:

A polymer, designated ODA/BTDA, which is obtained by reacting an appropriate diamine with a dianhydride. The polymer is a polyimide having the following formula: Poly[N-(4,4'-diphenylether)4,4'-carbonyldiphthalimide]. A comparable polyimide, designated MDA/BTDA, is obtained by replacing the oxygen linkage in the diphenylether group with the methylene linkage. These chemical structures provide adequate flow characteristics for lamination processing, without appreciably decreasing the thermal stability of the adhesive below that of the polyimide-film insulation.

How it's done:

The polymers are prepared by a condensation reaction between the diamine and dianhydride in a suitable solvent. For example, the ODA/BTDA is obtained by refluxing 4,4'-diaminophenylether and benzophenone 3,4-3,4'-tetracarboxylic dianhydride in N,N'-dimethylacetamide as a solvent.

Notes:

1. Permanent homogeneous polyimide-film flat conductor cables were laminated in 5- to 10-foot lengths using the new polyimide adhesive on a laboratory scale. Equipment for a continuous production-scale lamination process was not developed in this project.
2. The adhesive has also been used in the lamination of copper to copper for the preparation of multilayer circuit boards. The process has been satisfactorily developed using flat presses for laminates as large as 8×10 inches.

Patent status:

Title to this invention has been waived under the provisions of the National Aeronautics and Space Act [42 U.S.C. 2457 (f)], to Quantum, Inc., Lufbery Avenue, Wallingford, Connecticut.

Source: J. C. Montermoso, R. L. Taylor, and T. R. Saxton of Quantum, Inc. under contract to Marshall Space Flight Center

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Category 03

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1