NASA TECH BRIEF

Marshall Space Flight Center

Development of a Polyimide for Use as a Temperature and Solvent Resistant Sealant

The problem:

A special polymer sealant is needed for fuel tanks that are used at extreme temperatures. Such a polymer should be solvent and temperature resistant and compatible with titanium alloys.

The solution:

A polyimide was developed by the interaction of benzophenone tetracarboxylic dianhydride (BDTA), polyoxypropylene diamine (POPDA), and oxydianiline (ODA). Its properties are more suitable than anything previously available.

How it's done:

An aromatic dianhydrid and a diamine react to give a polyamide-acid intermediate readily converted to a polyimide by heating. Currently, the polyimides with the best high-temperature sealant properties are made from BTDA and POPDA with smaller amounts of ODA, methylenedianiline (MDA), and a curing agent such as EM-308. The following is a table of properties achieved:

Property	Test Result
Thermal stability	233K to 533K (-40F to 450°F)
Solvent resistance	H_2O resistant, 5% volume swell after 24 days at 300K (75°F)
Adhesion (Lap shear)	2.42×10^6 N/m^2 (350 psi)
Tensile Strength	1.24×10^7 N/m^2 (1800 psi)
Elongation	400 to 600%
Compression set	85%

These polymers might also be useful as sealant coatings for metals other than titanium when high-temperature and solvent reliability is desired.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Code A & TS-TU
Huntsville, Alabama 35812
Reference: B72-10262

Patent status:

No patent action is contemplated by NASA.

Source: J. S. Roscoe and B. F. Clark of Quantum, Inc. under contract to Marshall Space Flight Center (MFS-21325)

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