

NASA TECH BRIEF

Lewis Research Center



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.

Flexible, Low-Cost Silicon Solar Cell Arrays

Arrays of silicon solar cells have been pressure-bonded to a flexible backing and protected by an FEP (fluorinated ethylene propylene) cover, all in one mechanized operation. Arrays packaged by this method are flexible, lightweight, insulated, resist breakage, and can be fabricated at a significant decrease in cost from conventional methods.

Rigid arrays of silicon solar cells have been utilized on a variety of space missions. For future space missions, larger arrays will be required for power loads in the multikilowatt range. Arrays are being developed utilizing flexible substrates which permit the larger arrays to be rolled or folded for more compact storage during launching. For present flexible arrays, 2 x 2 cm silicon solar cells, 8-mils (0.2 mm) thick, are glued to a flexible plastic sheet, usually a polyimide. The cells are covered individually with glass covers to protect them from electrons and protons in the space environment. The glass covers are cemented to the cells with an adhesive which requires an ultraviolet radiation protective filter on the cover.

FEP has properties which make it particularly attractive for fabricating silicon solar cell arrays. These properties include: low cost, flexibility, high light transmission, ability to bond to itself and other materials under heat and pressure, and tolerance to the space environment. Modules and small arrays have been successfully fabricated using FEP as the cover material and also as an adhesive for mounting the solar cells to a flexible substrate.

In this new method, the silicon solar cell arrays are made up of the substrate layer, an FEP layer, the solar cells and a cover layer of FEP. The package is sealed and bonded by applying heat and pressure. Tests indicate that a 5-mil (0.13 mm) thickness of FEP provides virtually the same protection for the solar cells as had been

provided by a 6-mil (0.18 mm) glass cover. Additionally, an ultraviolet filter is not needed.

Notes:

1. The following documentation may be obtained from:
National Technical Information Service
Springfield, Virginia 22151
Single document price \$3.00
(or microfiche \$0.95)

Reference:

NASA-TM-X-52875 (N70-41903) Improvements in Silicon Solar Cell Cover Glass Assembly and Packaging Using FEP Teflon

2. Technical questions may be directed to:
Technology Utilization Officer
Lewis Research Center
21000 Brookpark Road
Cleveland, Ohio 44135
Reference: B72-10177

Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free, nonexclusive licenses for its commercial use will be granted by NASA. Inquiries concerning license rights should be made to:

Patent Counsel
Mail Stop 500-311
Lewis Research Center
21000 Brookpark Road
Cleveland, Ohio 44135

Source: A.F. Forestieri, J.D. Broder,
and D.T. Bernatowicz
Lewis Research Center
(LEW-11069)