

# NASA TECH BRIEF

*Ames Research Center*



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## Aluminum Foil Interconnects for Solar Cell Panels

Solar cell panels which must operate in a temperature range of 173° to 483°K require solar cell interconnects which can withstand elevated temperatures. Examination of state-of-the-art techniques indicates that solder-plated copper wire mesh is a suitable interconnect when bonded by a high-melting solder to the titanium-silver contacts of high-temperature resistant solar cells. However, difficulties were encountered in fabrication, and the results of shear and peel tests indicated that a preponderance of failures in the interconnect bonds was due to the high heat fluxes used to form the solder bond.

Thermal diffusion bonding of nickel-titanium surfaces using silver mesh interconnects was investigated. Satisfactory results were obtained in tests for bond strength and temperature shock; however, there are several disadvantages to the use of thermal diffusion bonding as a production technique:

- (1) Bonding must be accomplished in a vacuum;
- (2) Approximately 2½ hours are required to bond the interconnects;
- (3) Available tooling space limits the number of cells that can be interconnected at one time.

Prior experience suggested that ultrasonic diffusion bonding might alleviate many problems, since it could provide a true metallurgical bond (even with dissimilar metals). This technique required no special tooling to maintain cell alignment; moreover, strong bonds (40 to 60 percent of parent material) can be achieved within a few seconds, removal of oxide or organic films is not required, and post cleaning of the bond is not necessary.

Excellent results were obtained by bonding aluminum foil interconnects to the titanium-silver contacts of solar cells with a commercially available sonic welding system and a specially-designed tip. A solar cell group of nine cells was easily fabricated. The performance curve for the group shows a sharp knee in the maximum power region, indicating that the process did not cause any significant degradation of solar cell performance.

The technique has also been successfully employed for bonding aluminum foil interconnects to deposited-aluminum cell contacts. However, in order to prevent shorting of solar-cell junctions during the contact-deposition process, it is necessary to use the masks and etching processes normally employed by solar-cell manufacturers.

### Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer  
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### Patent status:

No patent action is contemplated by NASA.

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