B72-10480

NASA TECH BRIEF

Lewis Research Center

High Intensity Solar Cell Radiometer

A radiometer has been developed using a silicon solar cell which can be employed under high intensity illumination conditions such as would occur in a close-solar-approach space mission or in monitoring high intensity lamps. This development resulted from a specific need to measure radiant light intensities up to 2800 mW/cm^2 (20 solar constants) with accuracy and repeatability, linear output with intensity level, and response time of a millisecond or less. Conventional silicon solar cells employed as radiometers have the desired characteristics, but are limited to use at intensities up to about 700 mW/cm^2 (5 solar constants). At higher levels, their output is no longer linear due to internal resistance effects; also, cell temperatures become high enough to further reduce their output and to cause cell breakage and failure of electrical contacts.

The radiometers consist of silicon solar cells with thin semi-transparent coatings of aluminum deposited on their front surfaces to permit transmission of only a small percentage of the light and reflect the remainder. The radiometers constructed were coated with aluminum several hundred angstroms thick deposited by evaporation across the entire front surfaces of the solar cells. This coating permits only five to ten percent of the light to reach the active cell surfaces and reflects the rest. Thus, at a radiation intensity of 2800 mW/cm^2 (20 solar constants), the cell is actually exposed to an intensity of only 140 to 280 mW/cm^2 (1 to 2 solar constants). Under these conditions, cell output is linear over the entire intensity range, and temperatures remain at acceptable levels. A thin coating of silicon monoxide applied over the aluminum coating protects the aluminum from abrasion.

Notes:

1. Radiometers constructed in this manner can provide rapid, accurate, real-time sensors for monitoring high intensity light sources and can be used both for close-solar-approach space missions and in laboratory or industrial applications.
2. No further documentation is available. Specific questions, however, may be directed to:
   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B72-10480

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to:

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

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(LEW-11549)

Category 01