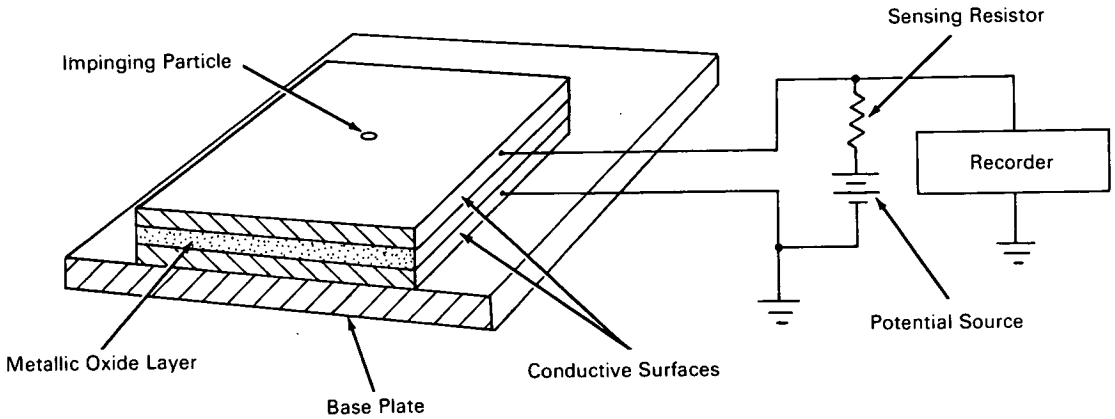
NASA TECH BRIEF

Microparticle Impact Sensor Measures Energy Directly



The problem: Small particles such as micrometeorites and steller and nebular dust form an important constituent of space. Information as to spatial density, mass, velocity, and direction of travel of these particles is necessary for future space exploration. Previous sensors have suffered from either or both of two limitations: gradual degradation of sensitivity by particle penetration, or a sensitivity threshold that prevents a measurable response to particle impact below a certain energy level.

The solution: A plate capacitor-type sensor whose response is a direct measurement of the relative energy of the impinging particle. Particles of sufficient energy to penetrate the sensor have no degrading effect.

How it's done: A thin film of conductive material is deposited on a glass base plate. A thin layer of nonconducting metallic oxide (silicon or aluminum) is deposited on the conductive film and a layer of conductive material is deposited on the metallic oxide layer. This forms a capacitor with the conductive layers acting as the plates and the metallic oxide as the dielectric. The upper conductive layer forms the target area. The two conductive layers are connected across a potential source through a sensing resistor. An impinging particle introduces a shock wave that is propagated through the metallic oxide layer. This produces localized heating that momentarily lowers the impedance of the metallic oxide layer in proportion to the intensity of the shock wave. This results in a discharge of the capacitor producing a signal across the sensing resistor of an amplitude which is a function of total particle energy. The intense heating of the metallic oxide layer does not materially alter its chemical composition and it returns immediately to its normally high-impedance state.

(continued overleaf)

Notes:

1. It is not necessary that the dielectric layer be penetrated to produce a measurable response. Particles that do penetrate the dielectric layer do not leave a charred, conductive path.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Goddard Space Flight Center
   Greenbelt, Maryland, 20771
   Reference: B65-10048

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

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