

NEW TECHNIQUES FOR THE DETECTION AND CAPTURE OF MICROMETEORIDS

J. H. Wolfe, San Jose State University, San Jose, CA 95192

In order to understand the origin and distribution of the biogenic elements and their compounds in the solar system, it will be necessary to study material from many classes of objects. Chemical, elemental, and isotopic measurements of returned samples of comets, asteroids, and possibly extra-solar system dust clouds would provide information on a particularly important class: the primitive objects. Extraterrestrial micron-sized particles in the vicinity of Earth are one source of such materials that might otherwise be inaccessible. The Space Station appears to be an eminently suitable platform from which to collect and detect these various particles. The primary challenge, however, is to collect intact, uncontaminated particles which will be encountered at tens of kilometers per seconds.

A concept for a micrometeoroid detector that could be deployed from Space Station has been developed which uses a large area detector plate implanted with acoustic transducers. When an impact event occurs, the resulting signal is subjected to spectral analysis providing positive detection, momentum information, and angle of incidence. The primary advantage of this detector is the large area which increases the probability of measuring events. A concept of a nondestructive micrometeoroid collector for use from Space Station has also been developed. The collector utilizes input port charging of the incoming particle followed by staged high voltage deceleration for nondestructive capture. Low velocity particles (local contamination) would be rejected due to insufficient energy and only uncontaminated micrometeoroids would be collected. Particles so collected would then be returned to Earth for subsequent analysis.