

NASA TECH BRIEF

Marshall Space Flight Center



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Biodetection Grinder

The problem:

A method of checking for embedded as well as surface micro-organisms is necessary to determine the presence of microbial life in outer space, and to determine whether spacecraft components sent into outer space are sterile. Embedded micro-organisms survive in some hard materials to great depths, and sampling has to be done at the proper depth for accurate evaluations. Also, some aerospace materials have to be reduced to sizes within from 1 to 8 micrometers in order to obtain the best biological assays. Conventional grinding cannot be used to obtain these sizings, because the high energy level results in heating the particles to temperatures that kill the organisms.

The solution:

A biodetection grinder, which employs a shearing action with a minimum energy input, was developed to obtain desired particle sizes in materials ranging from soft plastics to hard rocks.

How it's done:

The grinder cuts or grinds the specimen material under a slight pressure in a sealed transparent chamber. The specimen is held by a chuck-type clamp mounted on a slide that moves horizontally back and forth. The coupling of the drive shaft to the slide is such that a rotary motion of the drive shaft results in a reciprocating motion to the slide and chuck. A 100-rpm 27-Vdc motor provides the driving power for the reciprocating chuck, as well as for the grinding wheel and the linear feed subassembly.

The grinding-wheel drive shaft, motor, and coupling arrangement provide a variable controlled linear feed of the grinder into the specimen material. The grinder is attached to the drive motor with an adapter, which permits quick disconnects for replacement purposes, so that different grit-size grinding wheels may be used.

Linear movement of the grinder and its drive-motor subassembly is accomplished through a gear-reduction mechanism, which is driven by a variable-speed motor. The gear-reduction mechanism controls the forward movement of the cutter to 0.0001 in. (0.0025 mm) per revolution, and the total linear movement is 1 in. (2.5 cm).

Grinds from a sample may be collected in a polyethylene bag for aseptic storage. The polyethylene bag may be replaced by a Petri dish, if immediate bioassay of the grinds is desirable.

Notes:

1. A modified version of this biodetection grinder might be used in hospitals and biological laboratories involved with bacteriological research and testing.
2. Requests for further information may be directed to:
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Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:
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