Integrated Microbatteries for Implantable Medical Devices

Extremely small batteries could operate for years at nanoampere discharge rates.

NASA's Jet Propulsion Laboratory, Pasadena, California

Integrated microbatteries have been proposed to satisfy an anticipated need for long-life, low-rate primary batteries, having volumes less than 1 mm^3, to power electronic circuitry in implantable medical devices. In one contemplated application, such a battery would be incorporated into a tubular hearing-aid device to be installed against an eardrum. This device is based on existing tube structures that have already been approved by the FDA for use in human ears.

As shown in the figure, the battery would comprise a single cell at one end of the implantable tube. A small volume of Li-based primary battery cathode material would be compacted and inserted in the tube near one end, followed by a thin porous separator, followed by a pressed powder of a Li-containing alloy. Current-collecting wires would be inserted, with suitably positioned insulators to prevent a short circuit. The battery would contain a liquid electrolyte consisting of a Li-based salt in an appropriate solvent. Hermetic seals would be created by plugging both ends with a waterproof polymer followed by deposition of parylene.

This work was done by Jay Whitacre and William West of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

Innovative Technology Assets Management
JPL
Mail Stop 202-233
4800 Oak Grove Drive
Pasadena, CA 91109-8099
E-mail: iaoffice@jpl.nasa.gov

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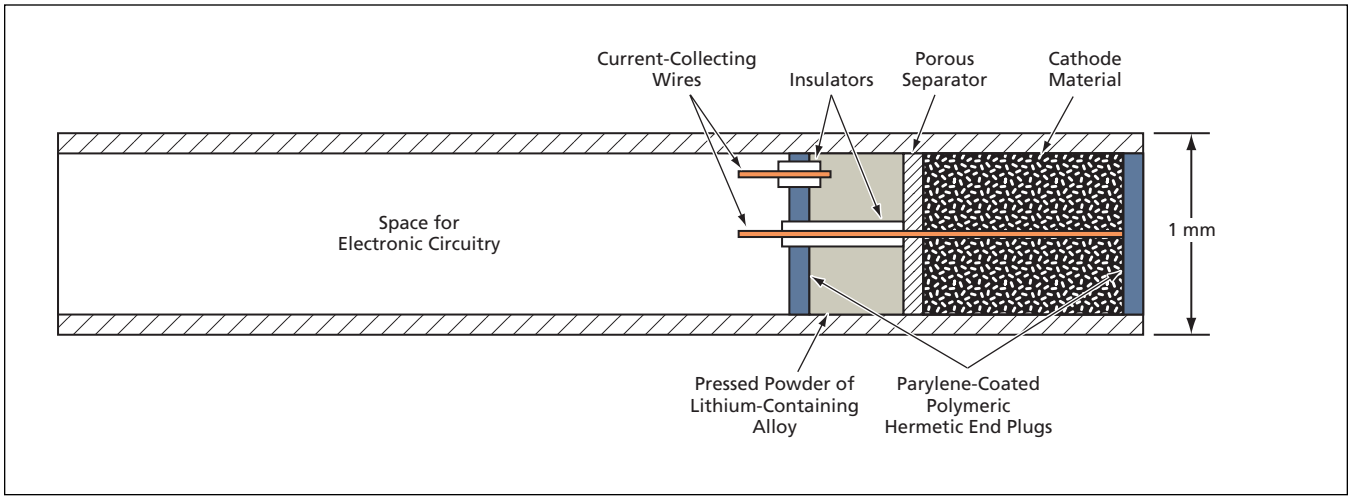

A **Microbattery Would Be Integrated** into a tubular implantable device. The battery could supply a total charge of about 0.7 mA·h — equivalent to sustaining a discharge current of 80 nA for a year.