

NASA TECH BRIEF



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Improved Conductive Paste Secures Biomedical Electrodes

The problem: Providing an improved nontoxic paste (skin solder) for attaching biomedical instrumentation electrodes to the skin of a human subject. A particular requirement to be met by the paste is that it retain its effectiveness in use over relatively long periods of time for monitoring physiological functions of astronauts. The paste must have a high electrical conductivity and be capable of forming an adherent flexible bond between metal and either moist or dry skin.

The solution: A paste consisting of a dispersion of graphite or silver granules in a mixture of polyvinylpyrrolidone (PVP) and a dilute water solution of glycerol. The glycerol serves as a plasticizer which increases the flexural strength of the paste.

How it's done: The dispersing solution is prepared by mixing 1 part by weight of PVP with 3 parts by weight of a 7% aqueous solution of glycerol. An effective paste can be made by mixing 1 part by weight of the dispersing solution with either 4.8 parts by weight of silver granules or 2.4 parts by weight of graphite granules. The electrical resistance of the silver paste is much lower than that of the graphite paste and does not increase with humidity over a wide range of values. At a relative humidity of 65%, for example, the resistance across 10 mm of the silver paste is only approximately 1 ohm, compared to 155 ohms for the graphite paste. At a relative humidity of 85%, the resistance of the silver paste remains essentially unchanged, whereas the resistance of the graphite paste increases to approximately 9,000 ohms.

Notes:

1. PVP was selected as the dispersing agent because of its adhesive properties, its ability to flow into microscopic crevices in dry skin, its nontoxicity to living tissue, and its ability to absorb moisture. Because of the latter property, the paste will not loosen if the underlying skin becomes moist as the result of sweating.
2. The paste is recommended for use with electronic medical instruments requiring attachment of electrodes to human subjects.
3. A related innovation is described in NASA Tech Brief B64-10025, May 1964. Inquiries may also be directed to:

Technology Utilization Officer
Manned Spacecraft Center
P.O. Box 1537
Houston, Texas, 77001
Reference: B65-10015

Patent status: NASA encourages the immediate commercial use of this invention. It is owned by NASA and inquiries about obtaining royalty-free rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

Source: Baylor University
under contract to Manned Spacecraft Center
(MSC-107)

Category No. 03