«Pipe» Experiment

SMALL-SIZED AND MINIATURE HEAT PIPES FOR COOLING SYSTEMS AND THERMAL STABILIZATION OF SPACE INSTRUMENTATION AND HARDWARE

Kostornov A. G., Shapoval A. A.

I. N. Frantsevich Institute for Materials Science Problems, NAS of Ukraine
3 Krzhyzhanovsky St., Kyiv 03142 Ukraine
tel: (380) + 44 +444 04 27, fax: (380) +44 +444 21 31, e-mail: dir@ipms.kiev.ua

Maintenance of normal thermal modes of space instrumentation and hardware is an important and difficult technological problem.

Problems of effective heat removal and maintenance of normal thermal modes of space vehicles have been solved by the following main methods: improvement of the extant heat engineering units, e. g. heat pipes. However, in terms of the thermal-physical aspect the conditions of heat pipes functioning in space are different essentially from those on Earth.

The IPMS NASU has designed heat pipes with high-performance metal-fibre capillary structures. Some of these pipes have been operating without failures since 1975 for thermal stabilization of orientation instruments mounted on space vehicles. In spite of the fact that these pipes have been used in space for a long time, an influence of microgravity on their parameters has not been studied.

On the other hand, the gravitation influence on thermo-physical processes occurring inside a heat pipe, leads to essential changes in the value of the pipe thermal resistance after long-time operation.

The anticipated results of heat pipes investigations under the space conditions would make a significant contribution to their theory. Results will be undoubtedly useful for design of cooling and thermal stabilization systems of space objects, satellite instrumentation, high-altitude aircraft, and rocket engineering as well as for development of high-performance heat-transfer units in the future.

«Indentor» Experiment

NEW METHOD AND INSTRUMENT FOR DEFINITION OF MECHANICAL PROPERTIES OF MATERIALS IN SPACE BY LOCAL LOADING WITH AN INDENTOR

Milman Yu. V., Ivaschenko R. K.

I. N. Frantsevich Institute for Materials Science Problems, NAS of Ukraine3
Krzhyzhanovsky St., Kyiv 03142 Ukraine
tel: (380) + 44 +444 30 61, fax: (380) +44 +444 21 31, e-mail: milman@ipms.kiev.ua

Exposure to space radiation, vacuum, and low temperatures, of materials and various instruments located on the external side of space vehicles (SV) results in the change of their structure and mechanical properties. Witness-specimens are currently used for control of the mechanical properties of materials. These specimens should be mounted on the SV shell, exposed to raw space and should be taken off before landing for further study on the ground. It is a very complicated and expensive operation, which does not provide any concrete control of the mechanical properties during the SV mission.

There is a necessity to analyse the mechanical properties and structure of materials on other celestial bodies, for example, on other planets during SV missions to them. However, right now it is only possible by specimens selection and their delivery to Earth for investigations.

The method of hardness and microhardness measurement has been widely used for many years for