

航天器用十一种热控材料热物理性质及其与显微组织和工艺因素关系的研究

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摘要 应用自行研制的激光脉冲法热导仪、小平板稳态法热导仪、铜卡计和冰卡计法比热仪, 对航天器用的十一种热控材料的导热系数、

导温系数和比热及其与材料显微组织和工艺因素的关系进行了实验研究. 结果表明, 在室温至1800℃温区内, 绝热材料和防热材料的导热系数均随温度升高而增大,

多孔绝热材料的有效导热系数是由多种导热因子相互作用的结果, 并存在对应于最小导热系数的最佳密度.

所得数据为热控材料的优选提供了科学判据, 亦为航天器的热控系统热设计提供了参数.

关键词 [航天器](#) [多孔绝热材料](#) [防热材料](#) [热物理性质](#)

分类号

## Thermophysical Properties of Eleven Thermal Control Materials Related to Processing Conditions and Microstructure for Spacecraft

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**Abstract** Laser flash method, thin plate steady state method and ice calorimetry for measuring thermal diffusivity, thermal conductivity and specific heat were established. The thermophysical properties related to microstructure of eleven thermal control materials for spacecraft were also studied experimentally. The results show that the thermal conductivity of thermal insulation materials and thermal protective materials increases with temperature increasing. The effective thermal conductivity of porous insulation materials is influenced by conductive factor, convective factor and radiation factor, and there is an optimum density with the minimum thermal conductivity. Consequently the results provide scientific criteria for thermal control materials selection and important data for spacecraft thermal design.

**Key words** [spacecraft](#) [porous insulation materials](#) [thermal protective materials](#) [thermophysical property](#)

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