

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Environmental Effects and Spacecraft Protection (6)

Author: Dr. Zi-long Jiao

Beijing Institute of Spacecraft Environment Engineering, China, jdragon01@sina.com

Dr. Lixiang Jiang

Beijing institute of satellite environment engineering, China, jlx8972@163.com

Prof.Dr. Zizheng GONG

China Academy of Space Technology (CAST), China, gongzz@263.net

Dr. Huang Jianguo

Center of Spacecraft Assembly Integration and Test, China Academy of Space Technology (CAST), China,

huangjg2012@163.com

Mr. Ji-peng Sun

China, sjp30892@163.com

Dr. Yunfei Zhu

China, jdragon01@sina.com

GC-MS AND IR SPECTROMETRY ANALYSES FOR COMPONENT IDENTIFICATION OF
MATERIALS OUTGASSING CONTAMINATION OF SPACECRAFT

Abstract

The non-metallic materials on spacecraft can severely outgass in thermal vacuum environment, then cause contamination effects to optical systems, thermal control systems and other systems, resulting degradation of performance, even lost of function. For effective control of contamination, we need to identify component of molecular contaminant and find the source of that component. We have created qualitative and quantitative methods of gas chromatography - mass spectrometry (GC-MS) for component identification. By using these methods, we have identified the component for severely contaminated solar array in thermal vacuum test, which is methylphenylsilicone, and the source material, which is solar cell adhesive; and we have found that the quantities of surface contamination of OSR were from $2e-7g/cm^2$ to $4e-7g/cm^2$. We have also created IR spectrometry method for component identification for its convenient sampling method compared to GC-MS. At the end of this article, the drawbacks of GC-MS and IR spectrometry methods are discussed.