NASA TECH BRIEF

Marshall Space Flight Center

Vacuum-Stripped Silicone Binder for Thermal-Control Paint

Thermal-control paints are used in space vehicles to protect men and equipment from solar radiation heat. Protection from solar heat, of course, is not limited to space applications. Nearly everyone has experienced the scorching heat in sun-baked buildings and automobiles on a hot summer day. The comfort of air conditioning and of elaborate heat insulation, however, is far from being available to everyone. Most people just have to grin and bear it through a hot summer day. In the future, however, thermal control paints applied to building roofs and perhaps automobiles will help protect man from the burning sun.

To further improve these thermal-control paints, a study was conducted on the use of a vacuum-stripped (modified) silicone elastomer binder. The principal motivation for this effort was the belief that vacuum stripping the silicone would reduce thermal outgassing from the dry paint film. While an evaluation of outgassing was not a part of this study, some efforts were made to assess the magnitude of the outgassing problem. In theory, vacuum distillation of any polymeric material will have at least two different results. First, it will remove those components which have a significant vapor pressure (partial pressure) at the distillation temperature. Low boiling point and low molecular weight materials (e.g., silicone monomers, solvents, stabilizers, cure promoters) will thus be preferentially removed. Second, elevated distillation temperatures will promote cross-linking and polymerization, increasing the average molecular weight of the undistilled silicone.

In this development, the silicone elastomer is placed in the evacuating system, gradually heated to 160° C and held at this temperature for 24 hours. It is then cooled to room temperature in vacuum, producing an upgraded, low outgassing polymer of increased molecular weight. The process could be used to upgrade commercially available epoxies by devolatilization of low molecular weight constituents. Upgraded polymers could then be used as thermal paint bases as well as conformal-coating compounds, adhesives, and sealants.

Notes:

1. This subject may be of interest to manufacturers of paints, polymers, adhesives, etc.
2. Request for further information may be directed to:
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   Marshall Space Flight Center
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   Reference: B73-10060

Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

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