December 1966 Brief 66-10578

# NASA TECH BRIEF



## Sprayable Birefringent Coating Enables Strain Measurements on Large Surfaces

**The problem:**

Although birefringent coatings have been widely used for photoelastic analysis of surface strains on structures, their use has been primarily limited to small-area coverage. Two-component spray systems have been proposed for large-area coverage because short pot life precludes the premixing of conventional curing agents and resins in sufficient quantities for spraying. Such systems, however, are quite expensive and require precise metering of the coating constituents. In addition, these coating compositions must be heated to reduce their viscosities sufficiently to allow spraying.

**The solution:**

A birefringent coating formulation containing constituents that can be premixed and sprayed as a single component with conventional paint spray equipment. Elevated temperatures are not required for spraying or curing of the coating material. This material has long pot life, and cures in a short time after spraying to produce a coating with relatively high and stable strain-optic coefficient.

**How it's done:**

The formulation consists of an epoxy resin, a thixotroping agent, two different curing agents or hardeners, and a solvent. Total hardener concentration is at or near the stoichiometric ratio based on the epoxide equivalent of the resins. The unique feature of the formulation is provided by using a ketimine as the primary curing agent.

In the absence of moisture, the ketimine reacts very slowly with the epoxy resin and thus ensures a long pot life. However, in the presence of moisture, which accumulates during spraying, the ketimine converts to an amine and a ketone. The resultant amine reacts with the epoxy resin, allowing the sprayed coating to cure rapidly, and the ketone is expelled. A second amine, which also functions as a hardener in the formulation, is used in sufficiently small concentration to have no appreciable effect on pot life. This amine also serves to accelerate coating gel formation during conversion of the ketimine. The solvent reduces the viscosity of the mixture sufficiently to allow spraying. The thixotroping agent is used to allow thick coats to be applied to vertical surfaces.

**Note:**

Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B66-10578

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: W. M. McGee and F. T. Humphrey
of Lockheed Aircraft Corporation
under contract to
Marshall Space Flight Center
(M-FS-1484)

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