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NASA TECH BRIEF

Adhesive for Polyester Films Cures at Room Temperature, Has High Initial Tack

The problem:

To develop a quick room-temperature-cure adhesive that will bond polyester-insulated flat electrical cables to metal surfaces and various other substrates. It was required that the adhesive form a sufficiently strong bond (high initial tack) on contact to eliminate the need for clamps to keep the cable from slipping before the adhesive is cured. Other requirements were that the applied adhesive be effective (remain flexible) over a temperature range from −65° to +100°C, resistant to attack by various chemical agents and fungi, and self-extinguishing when exposed to flame.

The solution:

An adhesive formulated from the following components in parts by weight:

Epoxy novolak resin	8
Diepoxide	2
Hydroxyl-terminated polybutadiene polymer	20
Toluene diisocyanate	2
Dibutyl tin dilaurate	0.1
2,4,6(tris)-dimethylamino methyl phenol	1
Tetrabromo bisphenol A	10
Antimony trioxide	3

How it's done:

The components, in the indicated proportions, are grouped in four batches as follows:

Batch 1: blend of epoxy novolak and diepoxide

Batch 2: blend of hydroxyl-terminated polybutadiene polymer, tetrabromo bisphenol A, and antimony trioxide

Batch 3: blend of toluene diisocyanate and dibutyl tin dilaurate

Batch 4: 2,4,6(tris)-dimethylamino methyl phenol.

Prior to use, these batches must be stored separately in appropriate containers (batch 4 must be stored in a tightly closed glass container, leaving no air space).

To prepare the adhesive for application, batch 1 is heated to slightly above 110°F and blended with batch 2. Batch 3 is then blended into the mixture of the first two batches, followed by the addition and blending (for about 10 seconds) of batch 4. The resultant adhesive, a paste of smooth consistency, is spread over the surfaces to be bonded, which are then brought into contact. Curing of the adhesive is completed within 1 to 2 hours at room temperature. Pot-life for spreading the adhesive is 8 to 10 minutes.

Notes:

1. The bond strength of the adhesive may be considerably increased by first applying a commercially available polyamide primer to the polyester film.
2. An adhesive under development for bonding a commercial polyimide film to various substrates is effective in a temperature range of −65° to +250°C. This adhesive, formulated with a pyromellitic diimide, cures in approximately 1 hour at 150°C, without application of external pressure. This adhesive has excellent laminating properties, but does not meet the requirement of high initial tack and semiflexibility at −65°C.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B66-10487

(continued overleaf)

Patent status:

No patent action is contemplated by NASA.

Source: G. W. Fust, C. J. Welchel, and C. M. Christian of Thiokol Chemical Corporation under contract to Marshall Space Flight Center (M-FS-938)