NASA TECH BRIEF

Self-Supported Aluminum Thin Films Produced by Vacuum Deposition Process

The problem:

To devise a method of producing self-supported, highly pure aluminum thin films for use in experimental studies involving reflection, transmission, and scattering of ultraviolet radiation, alpha particles, and beta particles. In conventional methods, the film is deposited on a substrate in one vacuum chamber and the resultant combination is transferred through the air to another vacuum chamber containing the apparatus used in the studies. Both the substrate and an oxide layer produced on the aluminum film by the air can interfere with these studies.

The solution:

Vacuum deposit the aluminum film on a polyvinyl formal resin film and then remove the resin by radiant heating in the vacuum. Self-supporting aluminum films as thin as 150 angstroms and having a diameter of 1 centimeter were produced in this manner. The aluminum films can be used as soon as the resin is eliminated.

How it's done:

The resin substrate is prepared by placing one drop of a 1-percent solution of polyvinyl formal in ethylene dichloride on the surface of cold water. The solvent evaporates in a few seconds, leaving a thin film of the resin on the water surface. This film is floated off the water and mounted over a hole in a plate, which is then placed in a vacuum chamber containing the aluminum to be vacuum deposited as a film on the resin substrate. The resin is then decomposed by radiant heating in the vacuum at approximately 250°C, leaving a self-supported thin aluminum film (which melts at approximately 660°C). When this procedure is carried out in the vacuum chamber containing the test apparatus, the aluminum film may be used in the same vacuum in which it was produced.

Notes:

1. The aluminum film will be capable of self-support at a minimum thickness of approximately 150 angstroms.
2. It is anticipated that self-supporting thin films of other metals can be produced by this method.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Ames Research Center
   Moffett Field, California 94035
   Reference: B66-10387

Patent status:

No patent action is contemplated by NASA.

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