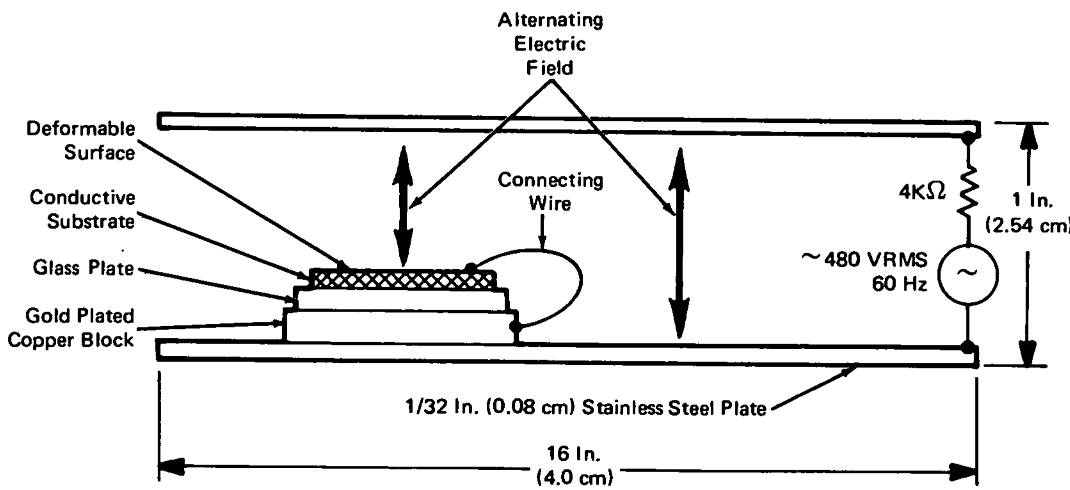
NASA TECH BRIEF
Marshall Space Flight Center

Photoemissive Coating

A method has been developed of applying a photoemissive coating to photoemissive holographic storage tubes through the application of a polystyrene coating to the substrate via glow discharge polymerization in an inert environment. The complex styrene coatings exhibit an amorphous structure of approximately 50 Å polycrystallite, possess a glass transition temperature of about 146°C, and have a melting temperature of approximately 205°C. The coatings have a dielectric constant of approximately 6 and vapor pressures of approximately 10^{-11} torr at 90°C and $5x10^{-10}$ at 150°C. The styrene monomer, with an additive for stability, is introduced into a vacuum system in an amount such that 100 percent evaporation yields a pressure within the system of approximately 0.15 torr (150 microns). The pressure is then increased to 0.5 torr (500 microns) by bleeding argon into the system.

The deformable surfaces upon which the styrene coatings are to be deposited are placed between two parallel circular stainless steel plates. The energy necessary to polymerize and crosslink the styrene monomer is supplied by an alternating electric field. To ensure adequate ionization and surface retention times, it is necessary to make electrical contact between the conductive substrate on which the deformable surface rests and one of the two circular plates to which the voltage source is connected. The arrangement, as illustrated, is satisfactory both for routine throughput complex styrene coatings and reasonably uniform electrical field distributions between the conductive substrate and the circular plate. A TIC film on a glass plate constitutes the conductive substrate. This structure is placed upon a gold-plated copper block with a wire connecting the substrate and the copper block, which rests upon the lower plate. A pressure contact is used to connect the wire to the TIC film, and the opposite end of the wire is soldered to the gold plated copper block.

The styrene coating is believed to grow in a macromolecular fashion with the entire coating being one large molecule. After deposition of the styrene coating onto the deformable surface, the entire structure is placed into a second vacuum system and the system pumped down to a pressure of approximately 10^{-7} torr. Antimony is added



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to the system and evaporated at 140°C to the desired thickness. Then cesium is added until a peak in photoemissive current is observed. At this point, cesium is discontinued, and the 140°C temperature is sustained until the observed photoemission is a maximum value. The photoemissive cesium-antimony layer has been observed not to react with the complex styrene coating over long periods, and the surface appears to be quite stable.

Notes:

1. In addition to the obvious application of the technique for polymeric coating, information concerning this innovation may be useful in the preparation of perfectly organized polymeric films that could be utilized as single-crystal membranes. These membranes would be capable of high selectivity filtration and/or separation.
2. Requests for further information may be directed to:
   Technology Utilization Officer
   Marshall Space Flight Center
   Code A&PS-TU
   Marshall Space Flight Center, Alabama 35812
   Reference: B72-10638

Patent status:

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