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**Cuomo et al.**

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(54) **NON-THERMIONIC SPUTTER MATERIAL TRANSPORT DEVICE, METHODS OF USE, AND MATERIALS PRODUCED THEREBY**

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(List continued on next page.)

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(52) **U.S. Cl.** ..... **204/298.07**; 204/298.06; 204/298.09; 204/298.11; 204/298.16; 204/298.19; 118/723 MP; 118/715; 156/345.33; 156/345.37; 156/345.38

(58) **Field of Search** ..... 204/192.12, 298.06, 204/298.07, 298.09, 298.11, 298.16, 298.19; 156/345.33, 345.37, 345.38; 118/723 MP, 715

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(57) **ABSTRACT**

A sputter transport device comprises a sealed chamber, a negatively-biased target cathode holder disposed in the chamber, and a substrate holder disposed in the chamber and spaced at a distance from the target cathode. A target cathode is bonded to the target cathode holder. A magnetron assembly is disposed in the chamber proximate to the target cathode. A negatively-biased, non-thermionic electron/plasma injector assembly is disposed between the target cathode and the substrate holder. The injector assembly fluidly communicates with a gas source and includes a plurality of hollow cathodes. Each hollow cathode includes an orifice communicating with the chamber. The device can be used to produce thin-films and ultra-thick materials in polycrystalline, single-crystal and epitaxial forms, and thus to produce articles and devices that are useful as metallic or insulating coatings, and as bulk semiconductor and opto-electronic materials.

**57 Claims, 12 Drawing Sheets**

