Low power thermal evaporation technique for microelectronics device fabrication

Microelectronics device fabrication requires the use of thin film deposition during key processing steps. The two most popular methods of deposition, thermal and electron beam evaporation, require high power supplies and highly specialized designs. This technology provides a low power alternative for thin film deposition using a highly resistive carbon material. This solution is a simplified and cost effective design that is compatible with existing deposition techniques.

Low power requirements allow for compact and cost-effective design

Conventionally, deposition methods utilize either high current or high voltage to evaporate thin films. This technology allows for evaporation at low-current (<20 A) and low-voltage (<5V) conditions using a highly resistive carbon element in place of conventional metal elements. As such, unlike traditional methods, this technology does not require large power supplies, bulky vacuum interconnects or additional cooling. This cost-effective technology is fully compatible with ultra high vacuum (UHV) deposition and can be used to evaporate metals such as gold, titanium, and chrome as well as semiconductor and oxide materials.

A prototype of the technology has been tested and been shown to effectively evaporate various metals.

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Applications:
- Thermal evaporation for thin film deposition in semiconductor electronics manufacturing
- Low-cost evaporators for metallization of electrical interconnects and cables
- Low-cost, compact thermal evaporators and molecular beam epitaxy systems

Advantages:
- Low power requirements allows system to integrate with commercial power supplies
- Low cost power supplies can be used
• No heavy-duty vacuum interconnects, wires or additional active cooling are required
• Allows for evaporator designs with significantly reduced size and simpler design
• Reusable, cost-effective, and scalable heating element
• Fully compatible with UHV deposition, and can be used to deposit a variety of different materials.

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