Argonne NATIONAL LABORATORY

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Fabricating Dielectric Ceramic Films on Copper Foils (IN-09-006)

Leads to higher-performing, more reliable circuitry

The Invention

Scientists at Argonne National Laboratory have devised a method for coating a ceramic film on copper foil. The process begins by applying a layer of a sol-gel composition onto the foil and drying it at temperatures of up to 250 degrees C. Next, the dried layer is fired at temperatures between 300 to 450 degrees C to form a ceramic film from the ceramic precursor. The film is then annealed at temperatures ranging from 600 to 750 degrees C in controlled environment to develop the desirable crystalline structure. Thicker films can be created by repeating the steps. The fabrication process is performed under a flowing stream of specialty gas. This process produces dense and pinhole-free ceramic coatings on copper foils.

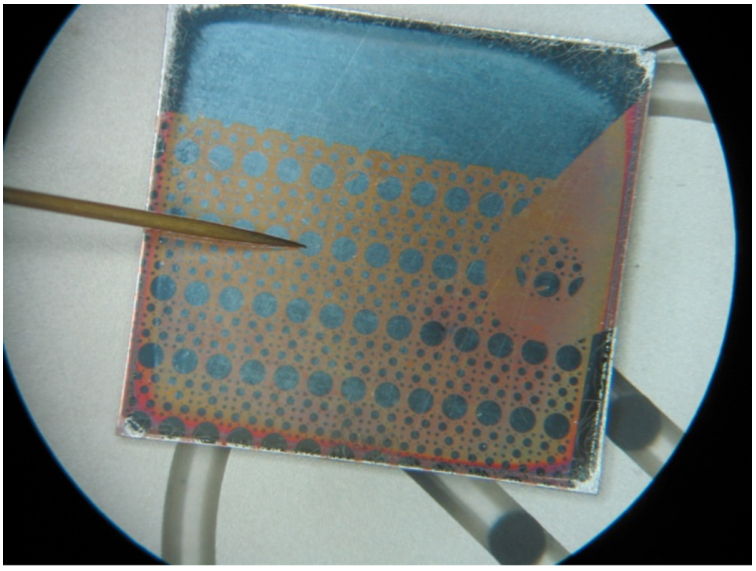
The fabrication process can be used to prepare ceramic materials consisting of various compounds including lead, magnesium, barium, zirconium, titanium and other elements. Preferably, the substrate consists of at least 90 percent copper—more preferably at least 95 percent copper—ranging between 0.01 and 1 millimeter in thickness. The copper substrate typically has a surface finish with RMS (root mean square) surface roughness of not more than 10 nm.

Benefits

The fabrication process has the benefit of creating a higher-performing, more reliable embedded circuit board.

Applications and Industries

- Electronics



Ceramic film capacitors built on a copper foil being tested on a probe station.

Developmental Stage

Proof of concept

Availability

Available for licensing

Argonne Invention Number

IN-09-006

Patent Information

US Patent Application 12/786,940

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