**Cold Sprayed Aluminum Capacitors for 3D Power Packaging Applications**

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Modern integrated power electronics face challenges achieving high power densities and efficiencies due to low-capacitor and inductor volumetric densities, increasing size, weight, and impacting performance. This study utilizes a low-pressure cold spray system to produce light weight porous aluminum coatings on lead frame metal foils, evaluating their potential for high-density capacitors. Through process parameter tuning, a 200 µm coating with 17% uniformly distributed porosity is achieved. Capacitance measurements showed a 22-fold increase in capacitance density and a 9-fold increase in surface area compared to planar capacitors. Thus, these cold-sprayed aluminum capacitors offer promise in enhancing power densities, efficiencies, and meeting size, weight, and performance requirements economically for power electronics and 3D power packaging applications.

**Keywords**: Capacitors; Power packaging; Power modules; Cold Spray; Aluminum

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