287g Particle Aldtm Based Ultrafast Electrical Surge Suppression Devices

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Novel Metal Insulating Varistor (MIVs) precursor materials are synthesized by placing conformal and pinhole-free nanothick insulating films on the surface of highly conductive micron sized metallic particles. The nanocoating is done by Particle ALDTM. The varistor precursor materials are embedded in a coaxial prototype test device using a hardened non-conductive polymeric binding compound. Electrical testing is carried out using thrust voltages of 5,000 and 20,000 volts. The electrical response of the prototype device is analyzed using a 6 GHz oscilloscope. Response times less than 1 nanosecond are measured, thus providing electronics protection levels capable of defending against Electromagnetic Pulse (EMP). When compared to commercial Metal Oxide Varistors (MOVs), the ALD based MIVs are capable of significantly reduced transient voltage response times (< 1ns), greater energy handling capability, and improved protection levels. This goal is achieved by reducing the particle insulation layer to atomic dimensions via Atomic Layer Deposition (ALD), thus providing an insulative thickness between conducting particles that is capable of allowing the quantum tunneling (QT) phenomenon to occur. In this presentation, we examine the ALD nanocoating of micron sized metal powders and the fabrication of the coaxial prototype varistors. Discussion includes the electrical characterization of the prototype device.