

Post doc offer 2019-2020, Grenoble

Title: Development of percolative nanodielectrics with giant permittivity for high voltage integrated capacitors

Location: CEA Grenoble – CNRS LTM

Duration: 1 year, 2530-2920 € gross monthly (1950-2250 € including social security), according to experience

Description of the work:

Capacitors are the best-selling electronic component in the world but they are still less miniaturized of all. For high voltage, dielectrics are exclusively of polymers. Polymers have low dielectric constants that are blocking the widespread process of miniaturization for electronics. In labs, novel nanocomposite polymers are much studied because they can go beyond the natural properties of simple polymers. The topic of this work is to study high voltage percolative nanodielectrics with giant permittivity that does not naturally exist. It comes from backgrounds of the lab where one seeks to bring together nanoparticles and polymers for microelectronic applications. With metallic nanoparticles, such systems provide at the electric percolation threshold a divergence of the conductivity and permittivity of the medium. The work is here on manufacturing such composites for high voltage applications mixing metallic nanoparticles after surface functionalization with a high voltage polymer host. The first task entrusted to the candidate will be to establish with precision the electric percolation threshold as a function of the volume fraction of nanoparticles. Then, he will be responsible for the formulation of suspensions and the deposition of films for the fabrication of integrated capacities on 200 mm diameter silicon wafers on the LETI platform. The candidate must have skills in physical chemistry (sonochemistry, miniemulsion, surface functionalization, polymerization ...) and will learn the manipulation of nanoparticles in a microelectronic cleanroom environment. He will have to master a set of nano characterization techniques in liquid and solid such as DLS, TGA, DSC, Raman spectrometry, HRTEM and ellipsometrie in heterogeneous media. He will participate in the electrical testing and he will establish the connections between electrical and structural properties using models of mixture laws and percolation theory.

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