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Assembly of nanoclusters for application as a variable capacitor NATHALIE LIDGI, P. SENEOR, J. CARREY, D. VEAUTIER, G. VIAU, F. NGUYEN VAN DAU, A. FRIEDERICH, A. FERT, A. VAURES, UNITÉ MIXTE DE PHYSIQUE CNRS-THALES TEAM, ITODYS TEAM — Variable capacitors are widely used electronic devices; we propose a new concept based on a 2D-assembly of clusters. We are investigating the synthesis, structural and transport properties of assemblies of metallic clusters in structures such as Metal / Dielectric / 2D assembly of clusters / Dielectric / Metal. Due to the Coulomb blockade phenomenon, a minimum voltage has to be applied between the two electrodes in order to measure a current. It is, thus, possible to control the charge on the assembly of cluster and consequently, the differential capacitance of the junction. The amplitude of the capacitance variation is directly linked to the clusters assembly properties (size distribution and density). We have studied samples with different assembly: junctions entirely made by sputtering present, at low temperatures, a behavior comparable to the current "varicaps." Junctions made part by sputtering (electrodes and dielectric), part by chemistry (assembly of nanoparticles), demonstrate the importance of the cluster density.

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