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Scaling Behavior of Dielectric Switching in Nano-assemblies[1]
FENG CHEN, JASON SHULMAN, STEPHEN TSUI, YUYI XUE, C. W. CHU[2], Texas Center for Superconductivity, University of Houston, Houston, TX 77204-5002 — Recently, we have reported a field-induced sign-switch of dielectric constant (ε') for urea-coated $Ba_{0.8}Rb_{0.4}Ti_O(C_2O_4)_2$ nano-particles (U-BRTOCO) in silicone oil and demonstrated that the observed negative ε' is an intrinsic property of the nano-particle assemblies A systematic study has been subsequently carried out on the switching of ε' under a bias field for U-BRTOCO and other nano-particle assemblies under different conditions. The switching frequency (ω_c) is found to be closely related to the zero-frequency electrical conductivity ($\sigma(0)$) of the assemblies. Such a scaling behavior for different nano-assemblies under various conditions gives us strong insight of the origin of the negative ε'. The possible models such as plasma and 2D electron-gas (2DEG) are compared.

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