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Many-body effects on the capacitance of multilayers made from strongly correlated materials[1] SIMON HALE, JIM FREERICKS, Georgetown University — Recent work by Kopp and Mannhart on novel electronic systems formed at oxide interfaces has shown interesting effects on the capacitances of these devices. In our work, we identify effects on the capacitance that stem from many-body physics and from other factors. In order to do so, we employ inhomogeneous dynamical mean- field theory to calculate the capacitance for multilayered nanostructures. These multilayered nanostructures are composed of semi-infinite metallic leads coupled via a strongly correlated dielectric barrier region. The barrier region can be adjusted from a metallic regime to a Mott insulator through adjusting the interaction strength. We are able to vary the barrier thickness allowing comparison to the expected geometric capacitance. We also examine the effects of varying the temperature, potential difference, screening length, chemical potential, and electron filling. We set up a system that depletes the charge from the barrier so that the capacitance approaches the geometric capacitance, allowing us to study nonlinear effects.

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