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Capacitance in nanoscale bulk-heterojunction materials[1] NELSON COATES, California State University - Maritime — In their simplest form, capacitors can be thought of as geometric devices consisting of two conductors separated by an insulator. These two conductors can hold opposite charges, and as a result store energy in the region of electric field between them. The geometric capacitance of the most basic parallel-plate conductor geometry is defined as: $C_{geom} = \frac{\varepsilon A}{d}$ where $A$is the area of the conducting plates, d is the separation distance between the two plates, and ε is the electric permittivity of the insulator between the two plates. This parallel plate geometry can operate as a useful approximation for devices where the separation distance between two conductors is much smaller than their curvature or area. A promising way to achieve this geometry is with nanoscale bulk-heterojunctions (including both purely organic, and organic-inorganic composites) which combine conducting phases with an enormous interfacial area and very small separation. The formation of these morphologies has been studied to improve the efficiencies of technologically relevant devices such as solar-cells and radiation detectors, where the capacitance provides useful information about electron-hole recombination and transport. Here, we will extend these studies to explore bulk-heterojunction morphologies as a platform for capacitive energy storage.

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