Order vs. Disorder: Does Pore Geometry Affect the Electrochemical Performance of Carbon Electrode Nanoarchitectures?

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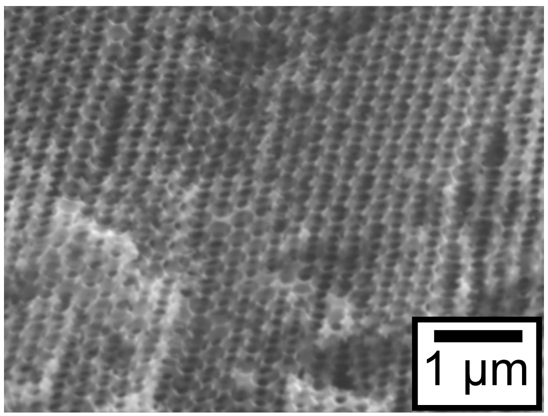
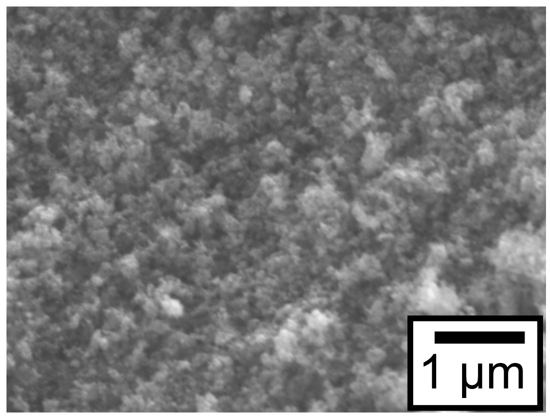
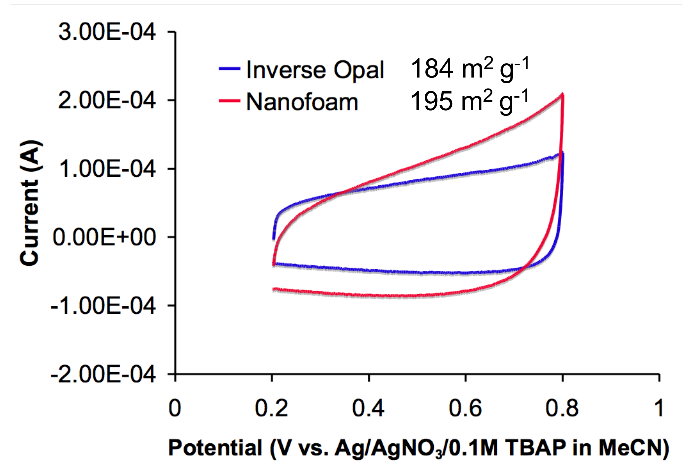
Hypothesis: Carbon nanoarchitectures with either ordered or aperiodic pore geometries will discharge similar electrochemical capacitances because the magnitude of capacitance is directly proportional to an electrode's electrochemically accessible surface area.



carbon inverse opal paper



carbon nanofoam



Results & Goals: We developed a toolkit of quality control methods that select for carbon inverse opal papers (ordered) and carbon nanofoams (disordered) with comparable surface areas. We estimate the surface area of both materials via electrochemical methods, and have refined our fabrication protocols to limit the formation of surface crusts that block internal pore networks. At this stage in the project, we seek: (1) to measure the pore size distribution of both nanomaterials now that their surface areas are comparable and (2) to test our initial hypothesis by comparing the effects of both pore geometries on the magnitudes of discharged capacitance.