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Computational modeling of polydisperse carbon particles in electrochemical flow capacitors BRANDON STACKS, HAOXIANG LUO, DEYU LI, KELSEY HATZELL, Vanderbilt University — Electrochemical flow capacitors (EFCs) are a promising new type of energy storage device due to high storage capacity, low fatigue rates, and high discharge rates. These devices employ the electric double layer of charged active carbon particles in a flowable slurry, i.e., a 'flowable electrode', to store ionic charges from an electrolyte solution. The objective of this study is to build upon previous simulations in our lab that studied the hydrodynamic and electrical interactions of the carbon particles in the flowing slurry. A Stokesian dynamics approach is used to simulate motion of the particles near a no-slip wall that acts as the stationary electrode, while also solving a generalized electrical circuit for charge transfer among the particles. In the present study, we focus on the effect of the smaller carbon black particles, which are commonly included in the slurry to increase particle-particle interactions, cluster formation, and charge percolation. The inclusion of these smaller particles (simulated as 5 times smaller in radius) necessitates an extension of the parameter values used in previous simulations. In this talk, we will discuss the modeling approach as well as the simulation results.

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