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Impact of pore size variability and network coupling on electrokinetic transport in porous media SHIMA ALIZADEH, Stanford University, MARTIN Z. BAZANT, Massachusetts Institute of Technology, ALI MANI, Stanford University — We have developed and validated an efficient and robust computational model to study the coupled fluid and ion transport through electrokinetic porous media, which are exposed to external gradients of pressure, electric potential, and concentration. In our approach a porous media is modeled as a network of many pores through which the transport is described by the coupled Poisson-Nernst-Planck-Stokes equations. When the pore sizes are random, the interactions between various modes of transport may provoke complexities such as concentration polarization shocks and internal flow circulations. These phenomena impact mixing and transport in various systems including deionization and filtration systems, supercapacitors, and lab-on-a-chip devices. In this work, we present simulations of massive networks of pores and we demonstrate the impact of pore size variation, and pore-pore coupling on the overall electrokinetic transport in porous media.

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