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Overlimiting current and water purification in porous materials DAOSHENG DENG, Department of Chemical Engineering, MIT, WASSIM AOUAD, Department of Chemical Engineering, École Polytechnique de Montréal, Canada, SVEN SCHLUMPBERGER, Department of Chemical Engineering, MIT, MARTIN Z. BAZANT, Department of Chemical Engineering and Mathematics, MIT — Salt transport in bulk electrolytes occurs by diffusion and convection, but in microfluidic devices and porous media, the presence of charged side walls leads to additional surface transport mechanisms, surface conduction and electro-osmotic flows, which become more important as the bulk salt concentration decreases. As a result, it is possible to exceed the diffusion-limited current to a membrane or electrode. In this work, we present experimental observations of over-limiting current to an ion-exchange membrane through a porous glass frit with submicron pores. Under this operation conditions, we also demonstrate the continuous extraction of depleted solution for water purification, including removing heavy metal ions, filtrating aggregated particles and reducing dye concentration. The porous media pave the way for practical water desalination and purification.

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