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Bipolar Membranes for Acid Base Flow Batteries MITCHELL ANTHAMATTEN, SUPACHAREE RODDECHA, JACOB JORNE, ANNA COUGHLAN, University of Rochester — Rechargeable batteries can provide grid-scale electricity storage to match power generation with consumption and promote renewable energy sources. Flow batteries offer modular and flexible design, low cost per kWh and high efficiencies. A novel flow battery concept will be presented based on acid-base neutralization where protons (H+) and hydroxyl (OH-) ions react electrochemically to produce water. The large free energy of this highly reversible reaction can be stored chemically, and, upon discharge, can be harvested as usable electricity. The acid-base flow battery concept avoids the use of a sluggish oxygen electrode and utilizes the highly reversible hydrogen electrode, thus eliminating the need for expensive noble metal catalysts. The proposed flow battery is a hybrid of a battery and a fuel cell—hydrogen gas storing chemical energy is produced at one electrode and is immediately consumed at the other electrode. The two electrodes are exposed to low and high pH solutions, and these solutions are separated by a hybrid membrane containing a hybrid cation and anion exchange membrane (CEM/AEM). Membrane design will be discussed, along with ion-transport data for synthesized membranes.

Mitchell Anthamatten
University of Rochester

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