

Contribution ID: 28

Type: Oral

Selective Ion Transport through Ion-Exchange-Membranes for Fuel Cells, Electrolyzers and Flow Batteries: The effect of “Ion Sieving”

Wednesday, 12 October 2022 09:00 (20 minutes)

Ion-exchange separator membranes (IEM) in electrochemical energy conversion and storage devices need to conduct a specific type of ion for mediating the electrochemical reactions taking place at anode and cathode while efficiently separating the electrochemically active species. In PEM-fuel cells and electrolyzers and in flow batteries, the conducting ions are mostly H^+ or OH^- , and parasitic transport of gases (H_2 and O_2 in the case of fuel cells and electrolyzers) and ionic species (e.g. vanadium in the case of flow batteries) must be suppressed. Since wanted and unwanted parasitic transport take place along the same pathways (aqueous ionic domains), these must be **chemically** and **morphologically** designed and controlled. **Ionic species** practically keep their hydration shell and their transport is sterically constrained by the width of aqueous pathways while non-interacting **gas molecules** utilize the accessible dynamic free volume for diffusion. In this presentation, I will discuss the tradeoff between selectivity and transport rates and make suggestions for choosing, optimizing and developing membranes with low parasitic transport for **fuel cells, electrolyzers and vanadium-redox-flow batteries**.

K. D. Kreuer and A. Muenchinger: *Fast and Selective Ionic Transport: From Ion-Conducting Channels to Ion Exchange Membranes for Flow Batteries*, Annual Review of Materials Research **51**:21-46 (2021)

C. Klose, T. Saatkamp, A. Muenchinger, L. Bohn, G. Titvinidze, M. Breitwieser, K. D. Kreuer, and S. Vierrath: *All-hydrocarbon MEA for PEM water electrolysis combining low hydrogen crossover and high performance*, Advanced Energy Materials **10**, 1903995 (2019).

Primary author: KREUER, Klaus-Dieter

Presenter: KREUER, Klaus-Dieter

Session Classification: Talks

Track Classification: Contributions