

Materials Science & Engineering and Metallurgical Engineering Graduate Seminar

Wednesday, April 10 2019, 4:10-5:00PM, FASB 295

Ashley Kennedy, BS/MS candidate MSE

Fabrication of biodegradable, superoleophilic, kappa carrageenan-based sorbents for adsorption of oil spills

A superoleophilic, biodegradable sorbent, developed from kappa carrageenan, benzalkonium chloride, and carbon nanofiber, is shown in this work to effectively adsorb significant amounts of oil while remaining sustainable in its production. This sorbent is also confirmed to be reusable through cycle testing. This work has fulfilled the need for a sorbent that has a high-adsorption capacity, is cost-effective, and is environmentally sustainable, as manifested both in its production and biodegradability. This sorbent material shows significant oil adsorption (13.3 g g^{-1} within 24 hours), mechanical squeezing analyses confirmed sorbent reusability, and degradation testing indicated sorbent stability. This work shows that a kappa carrageenan-based sorbent has the potential to be used as a cost effective and biodegradable material in the remediation of oil spills.

Alex Szendrei, PhD candidate MSE

Use of Embedded Electrodes to Resolve Anode and Cathode Electrode Impedance in Proton Exchange Membrane Fuel Cells

Electrochemical impedance spectroscopy (EIS) is a common technique to analyze kinetic and mass transport limitations at the electrodes in PEMFCs. However, fitting a spectrum to an equivalent circuit is an inverse problem, where multiple equivalent circuits describing vastly different kinetic processes can yield the same spectrum. Two electrode methods measure the impedance from both electrodes, thus the contributions from the anode and cathode are not resolved without deconvolution. A three-electrode device, using a pseudo-reference electrode, can resolve the different electrode contributions.

Using a novel pseudo-reference electrode embedded in the electrolyte the anode and cathode contributions were resolved in the EIS scans at open circuit and under a constant resistive load. Summing the three-electrode results showed reasonable agreement with the two-electrode scan.