



Wolfson Department of Chemical Engineering Special Seminar
Lecture Hall 6, Wolfson Department of Chemical Engineering,
Wednesday, November 27th at 1:30pm

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PhD student – mid seminar

(advisor: Prof. Dario R. Dekel, co-advisor: Prof. Charles E. Diesendruck)

Chemical Engineering, Technion

Ionomer Stability Studies for Anion-Exchange Membrane Fuel Cells

Anion-exchange membrane fuel cells can potentially revolutionize energy storage and delivery; however, their commercial development is hampered by a significant technological impedance, the chemical decomposition of the anion exchange membranes during operation. The hydroxide anions, while transported from the cathode to the anode, attack the positively charged functional groups in the polymer membrane, neutralizing it and suppressing its anion-conducting capability. In recent years, several new quaternary ammonium salts have been proposed to address this challenge, but while they perform well in *ex-situ* chemical studies, their performance is very limited in real fuel cell studies. Here, we use experimental work to show that water concentration in the environment of the hydroxide anion, as well as temperature, significantly impact its reactivity. We compare different quaternary ammonium salts that have been previously studied and test their stabilities in the presence of relatively low hydroxide concentration in the presence of different amounts of solvating water molecules, as well as different temperatures. Remarkably, with the right amount of water and at low enough temperatures, even quaternary ammonium salts, which are considered “unstable”, present significantly improved lifetime.