



MECHANICAL ENGINEERING MSc SEMINAR (30 min.)

Thursday, January 29 2026 at 13:30-14:00, Lady Davis Building, Room 250 and on Zoom at the [link](#)

Theory of Single-flow Multiphase Flow Batteries with Sedimentation

Ran Yossef Swisa

Adviser: Assoc. Prof. Amir Gat

Renewable energy sources such as wind and solar give rise to a problem, since they're not always available, they require grid-scale storage solutions. The field of flow battery technologies is a suggested solution for this problem. This is done by electrochemically charging certain chemicals and discharging them later, exchanging energy from electrical to chemical and then to electrical again. In order to widely distribute a solution for energy storage, we need to reduce its cost. A way to do so in flow batteries is by removing the membrane, one of the most common and most expensive components in a flow battery.

In this seminar, we explore a Membrane less redox flow battery with an elongated geometry and zinc-bromine chemistry. The low cost of the bromine makes it attractive. This seminar specifically explores single-flow multiphase flow batteries based on zinc-bromine chemistry with the addition of a polybromide phase in order to remove the expensive membrane that is usually found in this type of battery, which serves to lessen the corrosion on the anode, one of the battery's electrodes.

In order to solidify a better understanding of the battery examined in this seminar, the research is done with analytic and numeric tools, as well as comparison to experiments, to explore the theoretical model. We improve the current model shown in previous works, initially by adding the effects of gravity to the existing model, as the gravity pulls down the polybromide phase, making it more concentrated at the bottom of the battery, as well as modeling the flow field within the battery more accurately by applying a flow model designed for separating phases in a channel that takes in to account the variation in fluid properties between the two phases, furthermore we and examine the models predictions and it's accuracy, which reveal improved results relative to earlier works, however there is room is left for improvements. Lastly, future steps to advance the research on this problem are suggested.

Note: the seminar will be given in **English**

[SG1] הערות עם: Please choose מחק את המיותר

Seminars Coordinator: Prof. Sefi Givli.