MECHANICAL ENGINEERING SEMINAR

Monday, June 17th 2024 at 14:30, D. Dan and Betty Kahn Building, Room 217

Online: https://technion.zoom.us/my/amirgat

Multistable Metafluids

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The thermodynamic properties of fluids play a crucial role in many engineering applications, particularly in the context of energy. In this work, we suggest creating fluids with multistable thermodynamic properties in order to offer new paths for harvesting and storing energy via transitions between equilibria states. Such artificial multistable fluids can be created using the approach employed in metamaterials, which controls macro-properties through micro-structure composition. In this work, the dynamics of such `metafluids' is examined for a configuration of calorically-perfect compressible gas contained within multistable elastic capsules flowing in a fluid-filled tube. We study both analytically and experimentally the velocity-, pressure-, and temperature-fields of multistable compressible metafluids, focusing on transitions between different equilibria. We first examine the dynamics of a single capsule, which may move or change equilibrium state, due to fluidic forces. We then study the interaction and motion of multiple capsules within a fluid-filled tube. We show that such a system can be used to harvest energy from external temperature variations in either time or space. Thus, fluidic multistability allows specific quanta of energy to be captured and stored indefinitely as well as transported as a fluid, via tubes, at standard atmospheric conditions without the need for thermal isolation.

Seminars Coordinator: Assoc. Prof. Shmuel Gal.