Ben-Gurion University of the Negev
Blaustein Institutes for Desert Research
The Swiss Institute for Dryland Environmental and Energy Research
Alexandre Yersin Department of Solar Energy and Environmental Physics

Title:

Sustainable production of water and energy: Advanced membranes and cool sounds

Speaker:

Prof. Guy Ramon
Faculty of Civil and Environmental Engineering
Technion - Israel Institute of Technology

Abstract:

Water and energy production is a major challenge confronting human society. In this talk, I will discuss some of the directions undertaken in my research group, which are divided into two main categories: membranes, and sound waves.

The first part of the talk will focus on understanding the relation between the structure and performance of separation membranes that come in many forms, dependent on the materials used and the fabrication method. Identifying advantageous structures would benefit design and motivate the development of better control over the formation of a given morphology. The complex porous structures that define a membrane, can be either the actual separation medium, e.g. in the case of Dialysis, Micro- and Ultrafiltration or, in the case of composites used for gas separation, Nanofiltration and Reverse Osmosis, an underlying porous support that impacts the overall performance of the membrane. Such structural features ultimately dictate the water permeability and solute selectivity. The porous structures are distinguished by their various distributions - pore-size and location, which can further be divided between the membrane surface vs depth. Here, theoretical work will be presented, probing the impact of these distributions for several illustrative cases: pressure-driven flow as impacted by membrane surface pore locations and depth morphologies, the obstruction presented by a support layer to diffusion through the overlying thin-film, and the selectivity of a membrane as affected by a porosity gradient.

In the second part of the talk, the concept of using acoustic fields as a ‘virtual piston’ will be illustrated by considering two cases that mimic heat engines and pumps, but require no moving parts. Specifically, the mass transfer in a standing sound wave will be discussed as well as the excitation of an acoustic instability – generation of a standing wave, from a humidity gradient. This process presents exciting potential with application to low-temperature energy conversion.

Tuesday, December 20, 2016, 11:00
Lecture room, Physics Building (ground floor)