הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע״ש וולפסון
The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering Seminar

Thursday, January 30th, 2025, at 13:30

Room 6

Development and Validation of Microwave-Assisted Antisolvent-Based Drug Crystallization Technique for Drug Delivery Applications

Edwar Odeh

MSc Seminar

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Implantable biomedical devices have revolutionized organ treatment methods, but their effectiveness is often limited by immune system response. Previous studies have demonstrated that crystalline anti-inflammatory drugs can effectively reduce foreign body responses and implant rejection.
Crystalline drug formulations have gained significant attention as effective localized drug delivery systems. These formulations offer numerous advantages, including being carrier-free systems composed entirely of the drug (100% drug), which minimizes the risk of immune response, ensures chemical and physical stability, and enables prolonged drug release due to their slow dissolution.
Among the various crystallization techniques, the bench solvent:anti-solvent method is well-known for producing compact crystals and its ability to control crystal size and shape. However, this method has limitations such as low yield and prolonged crystallization times, making it less practical for scaling from research to industrial production. This research introduces a novel approach to overcome these challenges by incorporating microwave (MW) heating. Microwaves enable rapid and uniform heating and orient polar solvents under the microwave magnetic field, significantly enhancing crystallization efficiency. By manipulating MW-assisted crystallization conditions such as temperature, crystallization time, and solvent:anti-solvent systems and ratios, we obtain different crystal morphologies and sizes, which affect the crystals' release profiles. Additionally, this method achieves yields of up to 90% and reduces crystallization time from several hours to just a few minutes (2-3 minutes). These advancements optimize drug crystallization, providing crystals with desirable properties for various controlled-release applications.

Refreshments will be served at 13:15.