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

Tuesday, January 6th, 2026 at 12:30

Room 6

ALD on Photocatalytic Powders

Shakked Regev

MSc Seminar

Advisor: Prof. Yaron Paz
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Enantiomeric separation is an important challenge in the pharmaceutical and chemical industries whenever required to provide enantiopure drugs. Conventional techniques such as stereoselective crystallization and chiral chromatography often face significant limitations in terms of throughput, generality, and selectivity. This research presents a step towards a novel approach for enantiomeric separation, based on chiral molecular imprinting on photocatalytic substrates. The proposed method involves the adsorption of the undesired enantiomer (the distomer) onto a photoactive semiconductor surface to serve as a chiral template. Subsequently, an inert layer is grown around the template via Atomic Layer Deposition (ALD), forming a chiral cavity. This unique configuration facilitates the selective photodegradation of the distomer from a racemic solution, resulting in the enrichment of the desired enantiomer (the eutomer). Thus far, the research, originated in our group, was conducted on plates covered by different photocatalysts. This served well as a demonstrator, but suffered from slow kinetics due to the low surface area of the plates. This work examined the feasibility of extending the imprinting separation approach to powders, having higher surface area per volume ratio, with the aim of improving the throughput of the process.

The main goals of this research are: 1) Developing a robust and reliable coating protocol for the photocatalytic powder, via the use of custom-made ALD machine. 2) Minimizing the reaction time, allowing processing of larger quantities per unit time. 3) Enhancing the selectivity of said system, by optimizing the separation process for racemic and scalemic mixtures to produce enantiopure products. Here the proposed system comprises Titania powder as the photocatalyst, Alumina as the inert coating layer and various degradants as testing materials for the performance of the system in the different development stages. The kinetics of the system were analyzed using UV-Vis spectroscopy and high-performance liquid chromatography (HPLC) to observe the changes in degradant concentration. the results of this research show promising potential in coating of powders via ALD and in taking this novel separation method a step forward.

Refreshments will be served at 12:15.