



סמינר SEMINAR

Emulsion templating of renewable resource monomers for carbons with hierarchical porosities

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Templating within an oil-in-water emulsion can be used to generate porous polymers and carbons through polymerization followed by carbonization in the emulsion's external phase. Hydrothermal carbonization (HTC) is a relatively low-temperature ($\sim 180^\circ\text{C}$), high-pressure process for converting biomass into solid coal-like matter through exothermic dehydration and decarboxylation. The objective of this research was to combine the emulsion-templated synthesis of a polymer framework with polyphenol HTC carbonization to yield highly porous carbonaceous materials based upon renewable resource monomers. The framework was synthesized through the simultaneous free radical polymerization of a hydrogel based on MBAAm and the step-growth poly(urethane urea) reaction of either lignin or tannic acid with HDI. The resulting carbonaceous materials were characterized using SEM, nitrogen adsorption, FTIR, elemental analysis, and thermogravimetric analysis. For lignin, the combination of HTC and pyrolysis was successfully used to produce low-density carbon monoliths of 0.15 g/cm^3 . The monolith had bimodal closed-cell porous structures, with average pore sizes of 17.0 and $5.9\text{ }\mu\text{m}$, and a specific surface area of $878\text{ m}^2/\text{g}$. A monolith based on tannic acid had a density of 0.04 g/cm^3 , a specific surface area of $71.3\text{ m}^2/\text{g}$, and a $28.1\text{ }\mu\text{m}$ porous structure. A non-HTC-based carbon that was based on hypercrosslinked divinylbenzene synthesized within an oil-in-oil emulsion was also investigated. The resulting monolith had a density of 0.19 g/cm^3 and a specific surface area of $120\text{ m}^2/\text{g}$.

Supervisor: Prof. Michael Silverstein

ההרצאה תתקיים ביום ראשון, ה 20 ביוני 2021 בשעה 14:30, בחדר 302, בניין מידן, לבעלי תו ירוק, או דרך זום.

The lecture will take place on Sunday, June 20 at 14:30, in room 302, Meidan, for green pass holders, or via ZOOM.

Topic: Seminars - Materials

<https://technion.zoom.us/j/99592396977?pwd=azhKRUVrZkM2UDBENWIVVDExL2Q2UT09>

Meeting ID: 995 9239 6977 Passcode:

Passcode: mt302m