SEMINAR סמינר

Hierarchical Porosity in Carbons Derived from Hypercrosslinked Emulsion-Templated Polymers

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Microporous polymers are commonly used for gas storage, separation processes, and catalysis. The carbonization of microporous polymers can be used to generate porous carbons for a range of "green" energy applications including supercapacitors, batteries, fuel cells, and hydrogen storage. In many such applications, the presence of a porous hierarchy, from macroporous to microporous, is integral to functionality. PolyHIPEs (PHs) are macroporous polymers synthesized within high internal phase emulsions (HIPEs), emulsions in which the dispersed phase occupies over 74% of the volume. PHs are of interest for such applications as chemical synthesis, chromatography, ion exchange, separation, sensing, tissue engineering, and controlled drug delivery.

In this research, polymers with unique and advantageous hierarchical porous architectures were synthesized by hypercrosslinking PHs (PH-X). The macroporous PH monoliths, synthesized within HIPEs containing styrene, vinylbenzyl chloride (VBC), and divinylbenzene, were hypercrosslinked in a post-synthesis Friedel-Crafts reaction. Hypercrosslinking introduced microporosity, yielding specific surface areas (SAs) as high as 1652 m^2/g. The synthesis of interpenetrating polymer networks (IPN) PHs introduced mesoporosity, enhancing the hierarchical porosity. These microporous PHs were evaluated for their performance in sorption applications that included exposure to a variety of organic solvents, exposure to a variety of organic vapors, and exposure to aqueous solutions containing organic contaminants. Their performance was superior to the PHs that did not undergo hypercrosslinking and to a commercial activated carbon.

Carbons monoliths with similar hierarchical porosities were synthesized from the hypercrosslinked PHs. Hypercrosslinking a VBC-based PH with a SA of 8.9 m^2/g introduced microporosity, increasing the SA to 808 m^2/g, while retaining the macroporous architecture. The carbonization of PH-X (PH-X-P) yielded a porous carbon monolith with a nodular wall structure, reducing the SA to 553 m^2/g. Adding a porogen to the PH successfully enhanced the carbon microporosity, achieving an SA as high as 800 m^2/g.

Advisor: Michael S. Silverstein.

ההרצאה תתקיים ביום חמישי, ה-14 ביוני 2018 בשעה 14:30
באודיטוריום ע"ש דיוויד וואנג, קומה 3, בנין דליה מידן

The lecture will take place on Thursday, June 14th, 2018 at 14:30
David Wang Auditorium, 3rd floor Dalia Maydan Bldg.

כיבוד קל יוגש לאחר הסמינר