CONFÉRENCES DE CHIMIE
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« Design and Development of Functional Porous Materials »

RÉSUMÉ: In this talk, the author will introduce advanced porous or related functional materials for the applications related to energy storage and conversion1. The first material is cellulose-based macroporous honeycomb monoliths resembling natural tree xylem2. The honeycomb monoliths can be prepared by the ice-templating approach3, and possess straight channels with a size range of 10-100 μm. Ultra-low pressure-drop and chemical flexibility of the channel walls make the monoliths fascinating for separation and catalyst applications. The second material is mesoporous carbon with single-graphene walls4. Among so many graphene-based materials recently proposed, this new material has distinct features such as a high surface area approaching the theoretical maximum, ultra-high durability at high electrical potential, and mechanical elasticity. A great potential for applications to supercapacitors and fuel cells will be mentioned. The third material is ordered carbonaceous frameworks (OCFs) inheriting structural and chemical features of parent organic crystals5. The synthesis pathway for OCFs enables the development of new electrocatalysts having the advantages of molecular-based structure control and electric conductivity as well as chemical/thermal stability.

References:
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2. Pan, Z.-Z., Nishihara, H. et al. Cellulose nanofiber as a distinct structure-directing agent for xylem-like microhoneycomb monoliths by unidirectional freeze-drying. ACS Nano 10, 10689–10697 (2016).
3. Nishihara, H., et al. Ordered macroporous silica by ice templating. Chem. Mater. 17, 683-689 (2005).
4. Nishihara, H. et al. Oxidation-resistant and elastic mesoporous carbon with single-layer graphene walls. Adv. Funct. Mater. 26, 6418-6427 (2016).
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Faculté des arts et des sciences
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