

Chemical Engineering Seminar Series

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58 Greenberg Complex
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Unimolecular Channels in Lipid Bilayer: Mimics of Channel Proteins

Abstract

In biological system, channel proteins are responsible for the processing of ionic and molecular inputs and exports, sensing environmental stimuli and signals across cell membranes. Looking beyond the structural of channel proteins, it is possible to envision that synthetic molecules would also act of similar functions. The research on the synthetic mimics might help us on understanding the transport mechanisms, creating materials for separation, and developing therapeutic agents. We are interested in the construction of confined unimolecular tubular channels by considering their predictable conformation, high capacity of inserting into lipid bilayers, probably in a controllable manner. We have developed a new and general strategy for constructing synthetic transmembrane channels by utilizing unimolecular tubular structures. Using these channels, the selective transmembrane transport of water, chiral amino acids and ammonium, and the controllable transmembrane transport of potassium have been achieved by mimicking the key structure of the natural channel proteins. In addition, the high antimicrobial activity and low cell toxicity of the artificial channels have also been realized.

Biography

Jun-Li Hou obtained his B.S. in 2001 from Hubei University and Ph.D. in 2006 from Shanghai Institute of Organic Chemistry (SIOC), Chinese Academy of Sciences (CAS), with Professor Zhan-Ting Li. After two years postdoctoral research at The Scripps Research Institute with Professor Julius Rebek, he joined the Department of Chemistry of Fudan University in 2008, where he currently is a full professor of organic chemistry. He was awarded Chinese Chemical Society Prize for Young Scientists.

Professor Hou's independent research focuses on the construction of functional supramolecular systems, particularly transmembrane channels and biosensors. He developed a totally new strategy to constructing artificial transmembrane channels based on unimolecular tubular structures. Using this strategy, many complicated transmembrane transport processes, such as selective transport of proton and water, voltage-gated transport of potassium, and up-hill transport of potassium, have been achieved.