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BIOENGINEERING

PRESENTS

Can Model Biomembranes Achieve Chiral Recognition/Conversion of Molecules ?

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ABSTRACT:

A "Biomembrane" is a highly-organized self-assembly of biomolecules (i.e., lipids, proteins, etc.) and a key interface for the survival of a cell. The "*Membranome*" can be defined as the properties of vesicles (or liposomes), which arise from the bilayer molecular assembly of amphiphiles, focusing on "*emergent properties*" which are not present in the individual components, and is gradually recognized as an important research methodology to investigate the potential functions of vesicles (or liposomes) and to apply them for bioprocess design. A "*Self-Organizing System*", such as a liposome or vesicle, possesses several benefits in the recognition of (bio)molecules, where it can recognize them, at its "*designed*" surface, with "*multiple-molecular interactions*" that consist of (i) electrostatic interactions, (ii) hydrophobic interactions, and (iii) hydrogen bonds. In this presentation, I would like to introduce (1) how to design the surface of the Self-Organizing System and (2) how to utilize the designed surface (i.e., Chiral Recognition and Chiral Conversion of small molecules (i.e., amino acids and drug molecules)).

BIOGRAPHY:

Dr. Hiroshi Umakoshi's research group focuses on the systematic characterization of a self-organizing system (SOS) and the design of the SOS surface to induce their "*emergent properties*". The long-term goal of his research is to create a common strategy to utilize the emergent properties of the SOS both in the design of sophisticated chemical processes that acts in an "*entropy-driven*" manner and in the development of biomaterials (i.e., artificial enzymes, viruses, and organs).

Dr. Umakoshi earned his bachelor's (1992) and doctoral degrees (1997) from Osaka University. Following postdoctoral training at Lund University in Sweden, he joined the Chemical Engineering Division at Osaka University in 1998, and in 2012, started a new conceptual laboratory, "*Bio-Inspired Chemical Engineering*", as an extension of the Σ(sigma) multi-disciplinary research laboratory, "*Membranomics*" lab., in the Graduate School of "*Engineering Science*".

Dr. Umakoshi is the recipient of the Young Investigator Researcher Award from the Society of Chemical Engineers, Japan (2001), the Young Researcher Award from the Society of Membrane, Japan (2009), and Presidential Awards in Osaka University (2014 and 2015). Dr. Umakoshi is also a principal investigator of a research project entitled "Innovative Biotechnology based on Membranome" (JSPS/CSTP NEXT Program) (2011-2014). He is the author of more than 150 papers, 30 book chapters, and several important patents in his field.