崔宏瑋 (Hung-Wei Tsui),
Associate Professor of Chemical Engineering,
National Taiwan University

B.S. in ChemE, National Taiwan University, 2005
M.S. in ChemE, National Taiwan University, 2007
Ph.D. in ChemE, Purdue University, 2013

Research Interests

Chiral Separation, Chromatography, Molecular Simulations, Molecular Spectroscopy, Colloid Science

Biography

Hung-Wei Tsui is an Associate Professor of Chemical Engineering at National Taiwan University. Born in Taipei, Taiwan, Dr. Tsui completed his BS in Chemical Engineering at National Taiwan University in 2005, followed by an MS in the same field from the same university in 2007, conducting research under Prof. Li-Jen Chen. He earned his PhD in Chemical Engineering from Purdue University in 2013, where his dissertation, under the guidance of Prof. Elias I. Franses and Prof. Nien-Hwa Linda Wang, focused on the chiral recognition mechanism of polysaccharide-type sorbents. Afterward, he undertook postdoctoral research at National Taiwan University with Prof. Li-Jen Chen in 2014, studying the effects of polyelectrolytes on surfactant micellization. He joined the National Taipei University of Technology as a faculty member in the spring of 2015 and was promoted to Associate Professor in 2020. In February 2024, he began serving as an Associate Professor in the Department of Chemical Engineering at National Taiwan University.

Selected Publications

Hung-Wei Tsui*, Si-Xian Huang, Ting-Hsien Tseng, "Heterogenous adsorption mechanisms for describing enantioselective retention in normal-phase liquid chromatography," J. Chromatogr. A, 1704, 464140 (2023).

Hung-Wei Tsui*, Song-Zhu Lin, Yu-Chia Hsu, Feng-Ji Dai, "Retention modeling and adsorption mechanisms in reversed-phase liquid chromatography," J. Chromatogr. A, 1662, 462736 (2022).

Hung-Wei Tsui*, Pei-Wen Ye, Si-Xian Huang, "Effect of solvents on the chiral recognition mechanisms of immobilized cellulose-based chiral stationary phase," J. Chromatogr. A, 1637, 461796 (2021).

Ang-Yeh Lin, Kai-Tse Cheng, Sin-Chang Chen, Hung-Wei Tsui*, “Effect of solvent composition on the van’t Hoff enthalpic curve using amylose 3,5-dichlorophenylcarbamate–based sorbent,” J. Chromatogr. A, 1515, 179-186 (2017).

Liquid chromatography and its applications in chiral separation

Abstract

Enantioselective separations of chiral molecules are important in various chemical fields, such as pharmaceuticals and agrochemicals industries. Many drug molecules are chiral molecules. The human body contains numerous chiral sites, which show stereo-specific interactions with only one enantiomer, and may metabolize each enantiomer by separate pathways to produce different pharmacological activities. One enantiomer may be therapeutically effective, while the other may be toxic. Among various chiral separation methods, chromatographic separations are generally used. The recognition mechanisms which determine their enantioselectivities, however, are not completely understood. Many efforts have been made in the past to understand the chiral recognition mechanisms. The present state of the mechanistic studies and real understanding of the underlying mechanisms, however, are far behind their practical applications. The present talk is attempted as introduction providing an overview about most important modern CSPs and their chiral recognition and separation mechanisms.

Liquid chromatography as an important tool in chiral separation, has seen widespread application across industries like pharmaceuticals and biotechnology. To facilitate the development of analytical methods and the optimization of purification processes, modeling to describe and predict retention behavior has become a commonly employed theoretical tool. Solute retention behavior is influenced by various parameters, such as mobile phase composition, temperature, and pH value. Our recent efforts have led to the development of several theoretical models. These models aim to establish a unified theory for LC systems and enable the theoretical description of amino acid retention behavior. In this presentation, we will also introduce our ongoing research, including studies on reversed enantiomeric elution order and the retention behavior of ionizable samples. In our future research directions, we plan to include the development of simulated moving bed process and engage in interdisciplinary collaborations to develop analytical methods for biomarkers associated with neurodegenerative diseases.