

Bio-inspired Technology: Research, Development, and Commercialization

『 Zwitterionic Membranes and Biomedical Applications 』

Department of Chemical Engineering and R&D Center for Membrane Technology,
Chung Yuan Christian University, Chungli District, Taoyuan 320, Taiwan R.O.C

This presentation summarizes our laboratory's advancements in interface and membrane functionalization using zwitterionic biomaterials. We discuss the design of zwitterionic polymers and copolymers, such as sulfobetaine-based, carboxybetaine-based, or phosphobetaine-based materials, and the strategies employed for surface/membrane functionalization, including coating, grafting, or in situ modification. Emphasis is placed on the crucial role of zwitterionic membranes in key medical applications.

Our research primarily focuses on leukodepletion technology, which significantly enhances transfusion safety, disease prevention, and medical efficiency. Through collaborative efforts with our research team and students, we have developed a range of products and methods related to leukodepletion technology. These achievements have garnered widespread recognition in academia and have substantial societal impact, particularly in improving healthcare outcomes.

Furthermore, our research extends to disease diagnostics, where we have developed microfiltration technology to enhance the accuracy of disease detection by purifying blood samples directly. This has significant implications for early disease detection and treatment, potentially saving lives.

Additionally, our work encompasses disease treatment applications. We have developed blood platelet purification and concentration filtration products that play a crucial role in treating conditions like arthritis, improving treatment efficacy, and reducing patient discomfort. This contributes to enhancing overall quality of life and health outcomes.

Finally, we discuss potential future directions, including molecular design,

functionalization processes, and applications. Our research underscores the importance of zwitterionic biomaterials in advancing medical technologies and improving patient care.