Kirk J Ziegler, J Chromatogr Sep Tech 2015, 6:4
http://dx.doi.org/10.4172/2157-7064.S1.009

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International Conference and Expo on

Separation Techniques

August 10-12, 2015 San Francisco, USA

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Manipulating new parameters in the development of advanced separation techniques

Separations are a critical aspect of many chemical, biological, and pharmaceutical processes, often accounting for a majority of the product costs. Because of the high operating costs associated with energy consumption and emissions, some industries have started to re-evaluate established processes. For example, modern coal gasifiers focus on removing nitrogen and carbon dioxide from the feed stream before combustion due to their effect on downstream equipment. As new compounds and materials are also developed for these industries, new and advanced separation techniques are required to isolate the product. In many of these situations, the property differences between the desired product and the by-products are miniscule. In this presentation, I will focus on our development of nanotechnology-based separations that require the manipulation of non-standard parameters to achieve the desired separation. I will first discuss how the nanotechnology research field solved the 'impossible' separation of single walled carbon nanotubes (SWCNTs) into single-chirality suspensions. A key aspect of this separation is the incorporation of separation ideas from multiple disciplines. I will then discuss our recent work that demonstrates the first experimental verification of single-file diffusion for components in a gas mixture and how this mechanism can be used to separate small gas components.

Biography

Professor Ziegler received his PhD in 2001 from the University of Texas at Austin. After a postdoctoral position in Prof. Smalley's laboratory, he joined the Chemical Engineering Department at the University of Florida in 2005. His research group focuses on understanding the role of interfaces in one-dimensional nanostructures, such as single wall carbon nanotubes (SWCNTs) and vertical arrays of nanowires. His work on SWCNTs has focused on understanding the effect of surfactant-nanotube interactions on dispersion and separation processes. The ability to control these interfaces allow for efficient separation of SWCNTs and their integration into composite structures.

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