MSE-Colloquium@NTU

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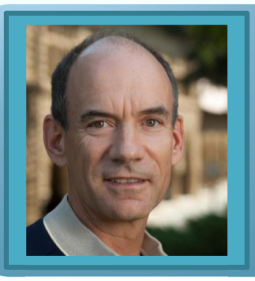

A Journey from Hybrid Films to Human Skin: Understanding Relationships between Structure, Processing and Function

Professor Reinhold H. Dauskardt

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About the Talk

Hybrid films comprising inorganic and organic components tailored at molecular length scales are used in a wide range of emerging technologies. These range from protective transparent coatings for ophthalmic lenses, plastic windows and stretchable electronics, display and photovoltaic devices, membranes in fuel cells, and dielectric layers in microelectronics and adhesive layers in high-performance laminates. I will describe our research by showcasing several examples involving high-performance hybrid materials as high-performance adhesive interlayers, as transparent protective coatings for plastics, and as transparent conducting films for flexible electronics. Specifically, I will discuss the molecular design of such multi-functional hybrids, new methods for processing using atmospheric plasma processing in air on plastics, and metrologies to characterize the adhesive and degradation processes which are important for reliable application over extended operating lifetimes. I will conclude by providing an overview of our research programs on the biomechanical function of human skin, and on innovations to control and alleviate hypertrophic scar formation in humans with an innovative and FDA-approved device technology. I will further describe a suite of quantitative models we have established and validated to understand the role of actives and formulations in skin care products on the biomechanical function of human skin. Such biomechanical properties are crucial in understanding the function of skin, its “feel,” firmness and cosmetic appearance. Biomechanical properties also play a central role in skin damage processes, such as chapping and cracking. By characterizing from molecular length scales to the level of the tissue itself, we demonstrate how the role of actives and formulations can be quantitatively understood, modelled and predicted. This represents a new quantitative approach to characterize and model the fundamental biomechanical function of human skin.

About the Speaker

Professor Reinhold H. Dauskardt is the Ruth G. and William K. Bowes Professor at the Department of Materials Science and Engineering, the Department of Mechanical Engineering and the Department of Surgery at the Stanford School of Medicine. He is a Visiting Professor at the School of Materials Science and Engineering at Nanyang Technological University in Singapore. He and his research group have worked extensively on integrating new hybrid materials into emerging devices, nanoscience and energy technologies, and also on the biomechanical function and barrier properties of human skin and other soft tissues. He is an internationally recognized expert on reliability and damage processes in device technologies and soft tissues, specifically the biomechanics of human skin and regeneration processes in cutaneous wounds. He has won numerous awards for fundamental contributions to skin science, including the Henry Maso Award from the Society of Cosmetic Chemists (2011), the IBM Shared University Research Award (2011), the Semiconductor Industry Association University Researcher Award (2010), an IBM Faculty Award (2006), the ASM International Silver Medal (2003), an Alexander von Humboldt Research Award (2002), and the U.S. Department of Energy Outstanding Scientific Accomplishment Award (1989).

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