

# Probing Molecular and Surface Interactions in Soft Materials, Biological and Engineering Systems

**Hongbo Zeng**

Department of Chemical and Materials Engineering,  
University of Alberta, Edmonton, AB, T6G 2V4, Canada  
(Email: [hongbo.zeng@ualberta.ca](mailto:hongbo.zeng@ualberta.ca))

Soft materials are central to a wide range of engineering and biomedical applications. Examples include polymers, biopolymers and soft biogenic materials. Many of the properties and applications of soft materials are strongly based on the weak but long-range interactions among the molecular or supramolecular constituents. However, it is still poorly understood how and why these interactions lead to hierarchical structures of soft materials and, in most cases, time-dependent physical and engineering properties. Improving our fundamental understanding of the interactions of soft materials and biological systems at the micro/nano scale and molecular level is needed to develop new materials and advanced techniques in materials science, bioengineering, chemistry and nanotechnology. Here I report some recent progress in understanding the fundamental intermolecular and surface interaction mechanisms in (1) polymers and oil sands engineering and (2) biological systems (dry adhesion of geckos and wet adhesion of marine organisms), and how we apply these discovered principles to develop novel functional materials and solve engineering challenges.

## References:

Hongbo Zeng, *et al.* (1) *Proceedings of the National Academy of Sciences of the United States of America (PNAS)* 2010; (2) *Journal of Biological Chemistry* 2010; (3) *Soft Matter* 2010, 2011, 2012; (4) *Macromolecules* 2010, 2007; (5) *Journal of Physical Chemistry C* 2011.