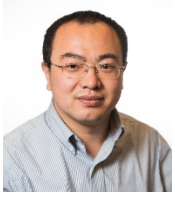
**Texas Tech University**
**Department of Chemical Engineering**
**Seminar Schedule**



**Driving Forces for Oriented Attachment Based Crystallization and Assembly**

Xin Zhang
Scientist; Pacific Northwest Nation Laboratory

**Abstract**

Driving forces for oriented attachment-based crystallization and assembly depend on azimuthal crystallographic alignment between nanoparticles. The types of driving forces that can be sensitive to relative orientation include Coulombic, van der Waals (vdW), hydration, and ion correlation forces. We report measurement of anisotropic forces between rutile TiO2 (001) nanocrystals as a function of their azimuthal orientation and surface hydration extent using a combined environmental transmission electron microscopy-atomic force microscopy (AFM) technique. Atomically flat rutile TiO2 (001) AFM tips and opposing rutile TiO2 (001) substrates were fabricated by focused ion beam milling to excise nanocrystals from the surface of a single monolith that was pre-oriented, cut, and polished to prepare the (001) face. At tens of nanometers of separation, the attractive forces are weak and show no dependence on azimuthal alignment nor surface hydration. At separations of approximately one hydration layer, attractive forces are strongly dependent on azimuthal alignment and systematically decrease as intervening water density increases. Furthermore, we report the measurement of anisotropic forces between ZnO (0001) and ZnO (0001) nanocrystals in Zn(NO3)2 solution using AFM based dynamic force spectroscopy (DFS).

**Bio**

Dr. Xin Zhang is currently working as a scientist at the Pacific Northwest Nation Laboratory (PNNL). Dr. Zhang received his doctoral degree on Chemical Engineering from Texas Tech University at 2014. Then he moved to Physical Science Division, PNNL as a postdoc research associate. His researches focus on interfacial science, crystal growth and material synthesis.

**Friday May, 1**

**11:00 am**

**ChE 101**