COURSE: CHEMISTRY 579, Surface and Colloid Chemistry for Engineers

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<tr>
<td>L01</td>
<td>MWF</td>
<td>10:00-10:50</td>
<td>ES 162</td>
<td>Dr. Robert Marriott</td>
<td>SB 221</td>
<td><a href="mailto:Rob.marriott@ucalgary.ca">Rob.marriott@ucalgary.ca</a></td>
<td>MWF 11:00 – 1:00</td>
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MATERIAL TO BE COVERED:

1. Introduction to colloids and surfaces
   - common colloidal systems
   - introduction and importance of common terms, e.g., specific surface area
   - review of free energies and chemical potentials

2. Solid-gas interfaces
   - Crystallite face indexing and surface defects
   - Basic gas adsorption and the Langmuir isotherms
   - Empirical isotherms, IUPAC isotherm classification and isosteric heats of adsorption
   - Common industrial mesoporous solids
   - The BET isotherm and mesopore volume distribution
   - Exercise 3 – drying a high-pressure CO\textsubscript{2} stream

3. Kinetic and statistical forces – particle and continuous phase
   - External forces and drift (terminal) velocity
   - Sedimentation coefficients (measurement)
   - Viscous forces and Brownian motion

4. Particle-particle electrostatic forces
   - Sedimentation equilibrium - a case study for aqueous pollutants
   - Particle-particle interactions
   - Inter-molecular forces related to inter-particulate forces
   - Hamaker theory
   - Electrical charges in dispersions
   - Guoy-Chapman and the Debye-Hückel approximation
   - Debye thickness and total surface charge
   - Double layer overlap
   - DVLO recap and the CCC scale

5. Colloidal stability
   - Stability ratio and overall flocculation rate
   - Steric effects
   - Aerosols - air filtration
   - Surface tension
   - Sesile drop, wetting and spreading, porosimetry
   - Wetting irregular surfaces and the Jamin effect
   - Surface active solutes – miscible, immiscible and partially miscible
   - Emulsion stability – HLB scale, PITs and emulsifiers in froth floatation
   - Foams

TEXTBOOKS:
Although no textbook is required, reading will be assigned using on-line resources available to University of Calgary Students. The following additional texts may be useful to students:

- *Colloid Science: Principles, Methods and Applications*, 3rd. Terence Cosgrove, Blackwell (2005) [online at the University of Calgary]