Oral Qualifying Exam – Surfaces and Colloids

SUGGESTED TEXTS:

- Arthur W. Adamson and Alice P. Gast, Physical Chemistry of Surfaces, 6th edition, Wiley, New York, 1997.
- Gabor A. Somorjai, Surface Chemistry and Catalysis, Wiley, New York, 1994
- Robert J. Stokes and D. Fennell Evans, Fundamentals of Interfacial Engineering, Wiley-VCH, New York, 1997.
- Jacob N. Israelachvili, Intermolecular and Surface Forces, 2nd ed., Academic Press, New York, 1991.

LEVEL (based on UIUC courses):
MATSE 480

NONEXHAUSTIVE LIST OF TOPICS:

1. Surface structure: reconstruction, relaxation - molecular orientation - how to measure surface structure?
2. Surface thermodynamics: molecular origin of surface energy - Gibbs dividing surface - surface excess functions - Gibbs adsorption equation - other implications
3. Curved surfaces: capillary pressure: the Young-Laplace equation - vapor pressure: the Kelvin equation - implications: nanoparticles, adhesion, etc.
4. Physisorption, chemisorption: physisorption versus chemisorption - adsorption isotherms - internal interfaces: critical micelle concentration
5. Varieties of inter-particle forces: Scale-up from molecules to larger particles - van der Waals, electrostatic, "structured liquids"
6. Structured liquids (polymers; surfactants; self-assembly; liquid structure).