

January 21, 2013

Choose among the following presentation topics by putting your name and whether this is your 1st, 2nd and 3rd preference next to the description in the list below. Submit your selection by Monday, January 28, 2013.

For February 4, 2013

1. Determination of equilibrium crystal shape using Wulff's theorem. Consider a hypothetical 2D crystal having a simple square unit cell. Assume that there are deep cusps in the γ -plot in the (10) and (11) directions. Given that γ_{10} is 300ergs/cm and γ_{11} is 250ergs/cm, make a Wulff construction to find the equilibrium crystal shape (a little bit of geometry will be required). Calculate the energy of the final Equilibrium Crystal Shape (ECS).
2. Ewalds construction: how does it work, examples.
3. Qualitatively describe the energy distribution of electrons emitted from a surface which is bombarded by an electron beam with incident energy $E_0=5000\text{eV}$. Identify several surface characterization techniques that rely on particular features in this energy distribution.
4. Multiple scattering theory of low energy electron diffraction and Pendry factor. Give example of a publication where it was used.
5. Work function for uniform surfaces. Draw diagram relatively to the vacuum level.
6. Thermionic emission. Richardson's equation.
7. X-ray photoemission spectroscopy: compare XPS, UPS and inverse photoemission.
8. Explain chemical shifts in X-ray photoemission spectroscopy, give an example.
9. Shake-up: final state effects in photoemission, give an example.

For March 11, 2013

1. Advanced models of physisorption.
2. Backbonding: definition, examples, when it is important?
3. Binding of ethane at a metal surface.
4. What determines reactivity of a metal?
5. Langmuir-Hinshelwood and Eley-Rideal mechanisms of surface reactions. Make comparisons using energy diagrams.
6. Three different growth modes of thin films: give examples of systems in each three category.
7. Ostwald ripening: definition, examples.
8. Mechanism of silicon etching in HF.
9. Porous solids formation.

For April 1, 2013

1. Homogeneous and heterogeneous charge transfer at the liquid/solid interface.
2. Determination of corrosion rate.
3. Deal-Grove model of Si oxidation.
4. Explain (with energy diagrams) the difference between scanning tunneling microscopy (STM) measurements for positively and negatively biased sample, give examples.
5. I-V mapping in STM.
6. Single molecule vibrational spectroscopy using STS.
7. Selection rules for FTIR and Raman spectroscopies applied to surfaces.
8. Sputtering for depth profiling.
9. Elastic recoil detection.