

MSE 722 – Surface Science

University of Virginia – Fall 2004

Goal: Learn the fundamental science of solid surfaces and modern methods of surface analysis, be able to extract information from reported data and decide what analysis technique is useful for different cases. The course will emphasize concepts but will include examples of applications.

Textbooks: The base of the course is: *Surface Science: An Introduction*, K. Oura et al. (Springer-Verlag, 2003). Search <http://isbn.nu/3540005455> to find best price (about \$87)

Additional material will be provided by the instructor.

Instructor: Raul A. Baragiola

Thornton Hall, B101; Phone: 434-982-2907; e-mail: raul@virginia.edu

Web: www.virginia.edu/ep/faculty/baragiola.html

Grading breakdown:	Homework and papers	40%
	Tests	50%
	Class participation	10%

Topics: (Number between brackets indicates book chapter)

- I. Introduction and survey of surface science. Background from kinetic theory of gases, vacuum science, and atomic physics. Ultrahigh vacuum. Surface preparation. [3]
- II. Surface structure. Crystallography. Relaxation and reconstruction. Diffraction methods. [2, 4]
- III. Surface analysis by electron spectroscopy. XPS, EELS, AES, UPS [5]
- IV. Probing surfaces with ions. Sputtering, ion scattering, SIMS [6]
- V. Microscopy. Field emission, SEM, STM, AFM [7]
- VI. Atomic structure and surface defects [8-10]
- VII. Electronic structure of surfaces. DFT. Surface states. Work function. [11]
- VIII. Gas adsorption and desorption. Surface diffusion. [12, 13].
- IX. Atomic forces at surfaces. Surface vibrations. [notes]
- X. Surface thermodynamics. Surface tension. Surface energy. Segregation.
- XI. Thin film growth [14]

(September 1, 2004)