

Surface Characterization Solutions for Biomaterials and Biomedical Applications

A Workshop on Solid Surface and Solid-Liquid Interface Analysis

May 2, 2024 | 9:30 AM – 4:00 PM

Venue

Covalent Metrology Lab
927 Thompson Pl, Sunnyvale, CA 94085

In this workshop, we focus on mechanical and chemical properties of material surfaces with relevance for biomaterial and medical applications. The program comprises of an introductory seminar to gain insights into the analytical methods for measuring zeta potential (surface charge), hardness, elasticity, and adhesion, followed by a practical session using the corresponding instruments and dedicated samples.

The **zeta potential** is a fundamental characteristic of the solid-water interface. It represents surface and interfacial charge. Despite of a common theoretical background, the analytical methods for the zeta potential analyses differ significantly for particle dispersions (by electrophoretic light scattering) and solid material surfaces (by streaming potential).

The analysis of the surface zeta potential serves versatile applications. In this workshop, we focus on case studies relevant for biomaterials and medical devices. We combine the analysis of equilibrated material-water interfaces with the dynamics of adsorption processes to elucidate protein interaction with material surfaces.

Nanoindentation is a surface characterization technique used for measuring the mechanical properties of materials such as hardness, modulus, viscoelasticity, creep, and fracture toughness. Nanoindentation, unlike conventional mechanical testing techniques, is particularly useful for characterizing the properties of complex materials such as composites, thin films and coatings, and soft materials such as hydrogels. In this workshop, we will focus on how nanoindentation can provide unique insights into the behavior and performance of natural or human-made biological materials by evaluating their mechanical properties.

Scratch testing is another surface characterization technique used to evaluate the cohesive and adhesive properties of thin films to determine the failure points of the film-substrate system. Of particular significance to the biomedical industry is the adhesion of coatings to stents, prostheses, and biomedical implants to ensure the compatibility and safety of the medical devices when they are applied to the human body. In this workshop, we will focus on how scratch testing can be employed for cohesion and adhesion testing of biomedical devices.

Tribology is the science of interacting surfaces in relative motion to study properties such as friction, wear, and lubrication. In this workshop, we will provide case studies that highlight how tribology can be used to understand friction and wear in hip and knee implants under real-life operating conditions.

Presenters

Thomas Luxbacher, PhD

Principal Scientist, Anton Paar GmbH

Parth Kotak, PhD

Applications Scientist, Anton Paar USA

Program

9:15 AM	Registration
9:45 AM	Welcome & Introductions
10:00 AM	Presentation 1: The complementarity of solid surface and liquid phase zeta potential: Focus on biomaterials and medical devices <i>Thomas Luxbacher, PhD</i>
10:45 AM	Presentation 2: Evaluating the mechanical properties, adhesion, and wear in biomaterials and biomedical devices using surface characterization techniques <i>Parth Kotak, PhD</i>
11:30 AM	Covalent Overview: Complementary techniques for surface and interface characterization
12:00 PM	Lunch
1:00 PM	Begin Demo Sessions: Nanoindent, Nano-scratch, and Zeta Potential <i>Parth and Thomas</i>
4:00 PM	Workshop Ends