Principles of Electrostatic force microscopy and applications

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This lecture will be devoted to the basics of electrostatic force sensing, and to an introduction to the different techniques used for this purpose: electrostatic force microscopy (EFM), in which one wants to directly measure electrostatic forces; and Kelvin probe force microscopy (KPFM) techniques, in which one wants to compensate/nullify electrostatic forces, by the application of a suitable dc bias.

Implementations for these techniques will be presented - mostly in the long-range regime for electrostatic forces - and discussed through examples taken in ambient air and/or vacuum. Measurement limitations, in term of resolution, sensitivity, temporal resolution, will be described. A special focus will be devoted to the achievement of quantitative results, beyond quantitative imaging. Common practical imaging artifacts or tricks will be described as well.

This lecture should also consist in an introduction to part of the lectures of L. Nony (KFPM techniques in UHV) and B. Grévin (KPFM applied to electronic and photovoltaic devices).