Towards high efficiency photocatalyst materials: *In situ* characterization of faceted $SrTiO_3$ nano-particle-electrolyte interfaces by Atomic Force Microscopy

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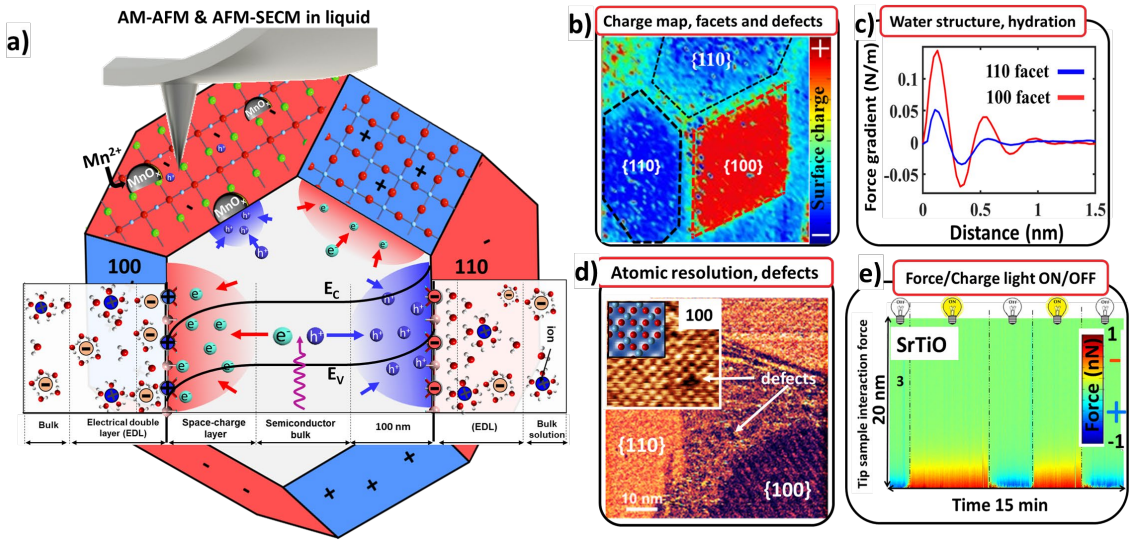
Anisotropy of shape and surface properties determine the functionality of faceted nanoparticles in various contexts including facet selective colloidal self-assembly, crystal growth, biosensing, improved photo/electrocatalytic activity and enhanced selective cellular and ions uptake. The characteristic anisotropy, surface proprieties and function of solid-liquid interfaces of crystalline faceted nanoparticles are believed to be essential for their performance but remains poorly understood and difficult to characterize and quantify. We use dual scale Atomic Force Microscopy to measure electrostatic and hydration forces of faceted $SrTiO_3$ nanoparticles in aqueous electrolyte at variable pH. We demonstrate (i) the ability to quantify strongly facet-dependent surface charges yielding isoelectric points of the dominant {100} and {110} facets that differ by as much as 2 pH units, ii) fluids composition controlled facet-dependent accumulation of oppositely charged (SiO_2) particles, and iii) that atomic scale defects can be resolved but are in fact rare for the samples investigated [1]. Atomically resolved images and facet-dependent hydration structure suggest a microscopic hydration and charge generation mechanism [1].



[1] Su, S., Siretanu, I., van den Ende, D., Mei, B., Mul, G., & Mugele, F. Facet-Dependent Surface Charge and Hydration of Semiconducting Nanoparticles at Variable pH. *Advanced Materials*, *33*(52), 2106229 (2021).