

## Demonstration of Scanning Probe Microscopy

### Experiment

The principle of SPM (scanning probe microscopy) will be demonstrated using a [Hysitron Triboscope™](#). This is a scanning nanoindenter, capable of contact mode imaging of the surface topography as well as [nanoindentation](#) under well-defined applied forces.

The specimen for this experiment will be a polished surface of a cross-section of 316-type austenitic stainless steel (basically a Fe-Cr-Ni alloy). By means of a novel process of low-temperature carburization, subject of ongoing research,<sup>1,2</sup> the material has been surface-alloyed with carbon to a level of  $\approx 12$  at% carbon in solid solution - this corresponds to  $\approx 10^5$  times the room temperature solubility limit. Consequently, the material exhibits an outstanding hardness in a surface layer ("case") with a thickness of  $\approx 25$   $\mu\text{m}$ .

The improvement in mechanical properties will be demonstrated imaging the surface topography of nanoindents in the hardened case with that of nanoindents in the non-carburized core of the material.

### References

- [1] F. Ernst, Y. Cao, and G. M. Michal. [Carbides in Low-Temperature-Carburized Stainless Steels](#). *Acta Materialia*, 52(6):1469-77, 2004.
- [2] Y. Cao, F. Ernst, and G. M. Michal. Colossal carbon supersaturation in austenitic stainless steels carburized at low temperature. *Acta Materialia*, 51(14):4171-4181, 2003.