Abstract:

In the recent year we were successful in completing our work demonstrating the hyperfine spectrum of a single spin. The lineshape of this
Hyperfine spectrum strongly indicates that the mechanism is due to dynamic polarization due to interaction between the tunneling electrons and the single spin that creates a local spin polarization in both the surface and the tip. Tunneling of this polarized electron beam creates positive and negative signals as observed in the experiment. These results are first successful steps in the development of a technique which is suitable for chemical identification on the single atom scale. We shall proceed in this direction by performing single nuclear spin detection using STM ENDOR, to measure ESR-STM at low temperatures,, and to measure single spin relaxation times by working in rapid passage conditions.

Additional results are the exact measurement of elastic constants on the nm scale. We show that we can measure the precise values of elastic constants of nanoparticles and show that they are dependent on the diameter according to Laplace's low. In this precise evaluation we take into account the radius of curvature of the tip and the elastic behavior of both the tip and the substrate. An additional work is directed in the evaluation of the local surface strain on a heterogenuous surface by analysis of the shape of the islands that grow with the Stransky Krastanov mode. We are proceeding by a similar evaluation by looking at the surface chemical reaction, and by using non orthogonal approach of the tip to the sample.

Additional experiments are performed in the direction of a dual probe STM where we are interested in dispersion on the nm scale and also local scattering of electrons propagating parallel to the surface.