CENTRE D'INVESTIGACIÓ
EN NANOCIÈNCIA
I NANOTECNOLOGIA
CAMPUS UAB. BELLATERRA. BARCELONA

SEMINAR

THEORY OF SPIN-POLARIZED SCANNING TUNNELING MICROSCOPY APPLIED TO LOCAL SPINS

JONAS FRANSSON
Dept. Physics and Astronomy, Uppsala University

We provide a theory for scanning tunneling microscopy and spectroscopy using a spin-polarized tip. It it shown that the tunneling conductance can be partitioned into three separate contributions, a background conductance which is independent of the local spin, a dynamical conductance which is proportional to the local-spin moment, and a conductance which is proportional to the noise spectrum of the local spin interactions. The presented theory is applicable to setups with magnetic tip and substrate in noncollinear arrangement, as well as for nonmagnetic situations. The partitioning of the tunneling current suggests a possibility to extract the total spin moment of the local spin from the dynamical conductance. The dynamical conductance suggests a possibility to generate very high-frequency spin-dependent ac currents and/or voltages. We also propose a measurement of the dynamical conductance that can be used to determine the character of the effective exchange interaction between individual spins in clusters. The third contribution to the tunneling current is associated with the spin-spin correlations induced by the exchange interaction between the local-spin moment and the tunneling electrons. We demonstrate how this term can be used in the analysis of spin excitations recorded in conductance measurements. Finally, we propose to use spin-polarized scanning tunneling micros- copy for detailed studies of the spin-excitation spectrum.

REMEMBER

JONAS FRANSSON
Specific Seminar: Theory of spin-polarized scanning tunneling microscopy applied to local spins
DATE: April 9, 2010
TIME: 12:00
PLACE: IFAE

T. +34 93 581 49 69
F. +34 93 586 80 20
www.cin2.es

CSIC ICN2 Institut Català de Nanotecnologia