

RESEARCH PROJECT FOR UNDERGRADUATES | IKASIKER 2016

Tuning the Kondo effect by molecular deposition

Magnetic impurities diluted in a metal create extra scattering centers that lead to a low-temperature increase in the electrical resistivity. This effect, named after the Japanese scientist Jun Kondo, is currently very fashionable as it has been found in a great variety of systems at the nanoscale, from quantum dots to molecules on surfaces.

In this project, we aim to control the Kondo effect in a metal film by the controlled deposition of magnetic molecules on its surface. The magnetic molecular centers, linked to the metal films via different types of organic ligands, will create the extra scattering centers and will promote the surge of the Kondo effect. The characterization of the electrical resistivity of the films will allow us to inspect in detail the interaction between the molecules and the metal, leading to questions regarding magnetic interactions across organic chains and the use of molecules and possible dopants in electronic materials.

In this project, the student will grow different metal (Au, Pt, Cu) thin films and molecules by thermal evaporation. The student will study the magnetic and electronic transport properties of the resulting films with the aim of obtaining a global picture regarding which magnetic molecules are more effective in their interaction with the different metals. Extensive use of an ultra-high vacuum systems and low-temperature cryostats will be required and the student will learn the basis of thin film deposition and characterization.

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SUITABLE FOR: physicists, chemists, engineers