seminars

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C/Faraday, 9
Conference Hall
Imdea Nanociencia
Ciudad Universitaria de Cantoblanco

Atomic resolution electron microscopy and spectroscopy: principles and examples

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Modern material science, in the majority of cases, involves nanotechnology, i.e. manipulation of matter with at least one dimension sized from 1 to 100 nanometers. To provide an insight at these, and even smaller scales, the high resolution microscopy has to be used. In the last decade, electron microscopes have improved their resolution down to the subatomic scale and are a perfect tool to answer the challenges of tailoring the devices on atomic scale. Aberration- corrected electron transmission microscopes are the unique experimental tool that can visualize the atomic structure away from the surface. Accompanied with the spectroscopies (particularly with the electron energy loss spectroscopy – EELS) these instruments can resolve the chemical and electronic structure on the atomic scale. We first make a brief overview of the principles and development of transmission electron microscopy and then give two examples to demonstrate the capability of modern micros copy.

The first example considers the ferromagnetism in epitaxial thin films of LaCoO3. Bulk LaCoO3 at low temperatures is a diamagnet, while epitaxial thin films are ferromagnetic. With the use of atomic resolution imaging and EELS we show that the ordering of oxygen vacancies in the strained thin film is responsible for ferromagnetism in such a system. The second example is the ferromagnetsuperconductor superstructure and the influence of epitaxial strain on this system. We show that the strain can produce nanopockets with the self-assembly of crystal structures that are not known in bulk.

Nanoscience y Nanotecnología: lo pequeño es diferente
Nanoscience and Nanotechnology: small is different

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