Applications of XAFS to nanostructures and materials science

Federico Boscherini
Department of Physics, University of Bologna, Italy.

In this lesson I will illustrate the use of X-ray absorption fine structure (XAFS) to the study of the local atomic structure in the rather broad field of materials and nano science. As an introduction I will briefly summarize the modern understanding of the origin of fine structure in X-ray absorption spectra, discuss the characteristics of the XAFS technique, including both XANES (or NEXAFS) and EXAFS and illustrate the role of XAFS in materials and nano science. I will then describe the use of XAFS in various fields, basing the discussion both on results which have "stood the test of time" and recent papers. Specifically I will discuss dopants and defect complexes in semiconductors, alloys, phase transitions, highly correlated oxides, thin films and interfaces, semiconductor quantum dots and metallic clusters.
Many of the topics are discussed in the book chapter:
F. Boscherini, "XAFS in the study of semiconductor heterostructures and nanostructures" in *Characterization of Semiconductor Heterostructures and Nanostructures*, edited by C. Lamberti, Elsevier, 2008.