

Raman spectroscopy of nanostructures and single molecules

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Inelastic (Raman) scattering of light is a powerful technique for the characterization of excitations in solids and molecules. In particular, vibrational spectroscopy provides a very specific and sensitive tool applicable to the study of fundamental phenomena and for sensing. This technique can be used for the study of nanostructures and single molecules, but in these cases amplification strategies are required. In this talk I will present a tutorial on Raman scattering in solids and molecules, and I will describe the different techniques used for the enhancement of the Raman efficiency. These include the use of electronic resonances (resonant Raman scattering, RRS), of plasmon resonances in metallic nanostructures (surface enhanced Raman scattering, SERS), and of photon confinement in microcavities (double optical resonant Raman scattering). These techniques will be illustrated with examples of current research on molecular and solid nanostructures, and on single molecules, performed at our laboratory and by other groups.

References:

M. Cardona, in *Light Scattering in Solids II*, edited by M. Cardona and G. Güntherodt (Springer, Berlin, 1982).

B. Jusserand, and M. Cardona, in *Light Scattering in Solids V*, edited by M. Cardona and G. Güntherodt, (Springer, Heidelberg, 1989).

A. Otto, in *Light Scattering in Solids IV*, edited by M. Cardona and G. Güntherodt (Springer, Berlin, 1984).

A. Fainstein and B. Jusserand, in *Light Scattering in Solids IX*, edited by M. Cardona and R. Merlin (Springer, Berlin, 2006).