Neutron Spectroscopy Of Nanoscale Materials

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The traditional image of neutron inelastic scattering is usually connected with studies elementary excitations - phonons and magnons - in condensed matter, possibly using large single crystals as samples. In this talk we shall concentrate on recent trends, making use of more advanced instrument configurations, characterized by simultaneous data aquisition over large ranges in the momentum-energy space and marked by applications to materials containing inhomogeneities on the nanometer scale. While neutron scattering cannot investigate individual objects on this scale, due to its inherent flux limitations, it is highly efficient to establish energy spectra and correlation functions in space and time characterizing the nano-objects and their ensembles. Spectroscopy of adsorbed molecules at levels equivalent to 10 μg of hydrogen, freezing-in of polar nanoregions in relaxor ferroelectrics and molecular nanomagnets are just a couple of examples to be cited, which illustrate applications making use of recent instrumentation developments at the ILL.