Why is it worth to use Synchrotron Radiation and Neutron large Facilities to study the properties of Materials of Interest? Detailed examples concerning the structure and dynamics of Polymers.

PROF. DAVID DJURADO

I-Principles, characteristics and respective advantages of Synchrotron Radiation (SR) sources and neutron sources.

I-1: Interaction X-rays/matter and neutron/matter.
I-2 What is scattering and what is diffraction? The Bragg relation is 100 years old.
I-3 How a SR source works? Main characteristics and which possibilities are opened for studying matter?
I-4 How scientific neutrons are they produced? What are the real specificities of neutron compared with X-ray radiation?

II-Structure studies.

II-1: Wide Angle Diffraction techniques
How can we use basic concepts of Crystallography to study the local structure of more complex materials?
One example: conjugated polymers and conjugated molecules for organic electronics.

II-2: Small Angle Scattering techniques
Exploring the matter in the scale range intermediate between local structure (1Å) and macroscopic structure (1µm).
One advantage of neutrons: the contrast variation very useful for studying soft matter.
One recent example: conjugated polymers in solution in their neutral and oxidized state.

III-Dynamics studies.

III-1: Considerations on the energy and time scales and corresponding techniques to study dynamics in matter. How neutrons and SR are respectively placed?

III-2: More focusing on Incoherent Quasi-Elastic neutron Scattering techniques for studying local molecular diffusion in solids
One example: Dynamics of counter-ions in highly conducting polymers.