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.

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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.

Lecture co-financed by the European Union in scope of the European Social Fund

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