

Neutron and synchrotron radiation techniques in materials science

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In the last decades, advanced experimental techniques based on synchrotron radiation (X-rays) and neutron beams have become more and more important in both fundamental and applied research in many different fields, from physics and chemistry to biology and medicine, as well as in materials science and engineering.

The huge amount of work carried out at the Large-Scale Facilities available in different sites around Europe have led to a deep understanding of both basic phenomena and of other very important features at the micro- and/or nano-scale, such as the microstructural characteristics of materials, even under operating conditions, very difficult and in some cases impossible to obtain using standard laboratory experimental techniques.

In this lecture the basic principles of synchrotron radiation and neutron techniques will be presented, together with a few examples of their practical application to materials science and engineering studies. Diffraction, imaging and small-angle scattering techniques in this field will be illustrated in particular, putting into evidence both similarities and differences between synchrotron radiation and neutrons, as well as their complementarity.