

STRUCTURE AND DYNAMICS OF NON-CRYSTALLINE MATERIALS AT THE INSTITUT LAUE LANGEVIN

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The determination of the structural and dynamical properties of non-crystalline materials is usually a difficult task because any scientific insight must be achieved without the mathematical amenities useful in the crystalline solid state. Special experimental techniques need to be employed and among them, neutron scattering is one of the most powerful. The Institut Laue Langevin (ILL) operates a nuclear reactor which is the finest steady-state source of neutrons in the world. In this work we introduce a large suite of instruments available at the ILL for structural and dynamical studies on non-crystalline solids or, more generally, amorphous systems, including liquids. After a short description of the Institute and its neutron source, an introduction on the neutron scattering techniques will be given. Then selected examples will be presented in order to demonstrate the characteristics and possibilities offered by the different kind of instruments. Thus data obtained in D4, a dedicated diffractometer for the study of liquids and glasses will show how to investigate short- and medium-range order in disordered materials, while the available instruments for small angle scattering studies can provide information on large structures. Concerning the dynamics, we will show the capabilities of time-of-flight spectrometers to cover large areas of the Q - ω map, while three-axes spectrometers can be used to explore in detail selected points in (Q, ω) , and particularly the low- Q region for the study of collective excitations. The use of high resolution instruments, either back-scattering or spin-echo spectrometers, to investigate the slow dynamics in systems such as amorphous polymers will be also mentioned.