

A decade of stress analysis by neutron diffraction at the LLB

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In the last decade neutron diffraction has been extensively used for stress analysis in components of technological interest. With the increasing number of technological problems with an industrial background, almost all the neutron sources have facilities for neutron strain measurements. In the last years, a new diffractometer ("DIANE"), entirely dedicated to stress analysis, was built up at the Laboratoire Léon Brillouin (LLB) in collaboration with the Italian INFM (Istituto Nazionale Fisica della Materia). The instrument has been designed in order to meet engineering requirements: good spatial resolution, accurate positioning of the specimen in three orthogonal directions and an adequate space for manipulation of heavy and cumbersome samples on the diffractometer.

After a brief presentation of the main characteristics of DIANE, some of the principal activities developed at the LLB around this instrument are presented. In particular, large part of this activity was dedicated to study the mechanical behavior of Metal Matrix Composites (Al/SiC and Ti/SiC) by the characterization of internal residual stresses. Some studies have also been done to evaluate microstructural parameters, such as the average size of coherently diffracting blocks and the mean-square microstrain, in technological material from diffraction data.

An effort was also done to introduce neutron diffraction technique for stress analysis to geological materials, and some examples will be shown.