Synchrotron techniques for the characterisation of Nb3Sn superconductors

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As compared to the different destructive techniques that are commonly used for the characterisation of Nb_3Sn strands, synchrotron techniques have important advantages. Quantitative results can be obtained during *in-situ* heat treatments or *in-situ* mechanical loading of the wires and sample preparation artefacts can be excluded. The high flux of high energetic x-rays that is provided by the high energy scattering beam line ID15 of ESRF enables new experiments with the highly absorbing mm thick composite superconducting strands.

In this presentation we will report synchrotron diffraction measurements that have been performed for studying the phase transformations during the reaction heat treatment of Nb_3Sn strands. By fast synchrotron micro-tomography the growth of voids in Nb_3Sn superconductors has been observed during *in-situ* reaction heat treatment. The void growth mechanisms have been elaborated by combining both micro-tomography and diffraction experiments during the same heat treatment cycle.

The elastic strain in the different phases of the fully reacted Nb_3Sn strands has been measured during *in-situ* tensile tests at 4.3 K in order to study of the reversible and irreversible degradation of the superconducting properties of Nb_3Sn strands.