

**Experimental simulation of the radiation tolerance of a nuclear material - case study of phosphate-bearing minerals**



<b>Laboratory / Team</b>	Center for Nuclear and Physical Sciences (CSNSM) Physical Chemistry of Irradiated materials Team	
<b>Contact</b>	Frederico Garrido: frederico.garrido@csnsm.in2p3.fr	
<b>Main topics</b>	Behavior of nuclear materials under radiation	
<b>Objectives/context</b>	Investigation of the radiation stability of application to phosphate bearing minerals (apatite) subject to various radiation sources.	
<b>Equipment / tools / software used</b>	JANNuS-Orsay platform; SRIM and Monte Carlo software	
<b>Level / Duration / Period</b>	L3 or M1 / 1 to 3 months / April-July 2019	
<b>Number of trainees</b>	1 student	
<b>Course description / main tasks</b>		
<ul style="list-style-type: none"> <li>• Rutherford backscattering characterization of irradiated nuclear materials in channeling conditions, with low-energy ions at characteristic fluences: simulating the degradation by alpha recoil.</li> <li>• Determination of the experimental conditions needed for implantation: use of SRIM simulation code.</li> <li>• Determination of the major crystallographic axis of a single crystal by measuring yield from Rutherford backscattering.</li> <li>• Measurement of damage profile of an irradiated crystal by recording RBS spectra in both random direction and aligned along a major crystallographic direction.</li> <li>• Analysis of RBS spectra channeling condition: use of Monte-Carlo simulation code to determine the damage profile. Measurement of the damage kinetics of the material of interest.</li> </ul>		
<b>Skills acquired on completion of the course</b>		
<ul style="list-style-type: none"> <li>• Setting electronic acquisition chain for alpha spectrometry; calibration of detector.</li> <li>• Estimation of the penetration depth of charged particles in the material - use of a SRIM Monte-Carlo simulation code.</li> <li>• Analysis of RBS spectra (chemical composition, depth distribution).</li> <li>• Analysis of RBS spectra in channeling conditions: extraction of depth distribution from damage fraction of the solid.</li> </ul>		