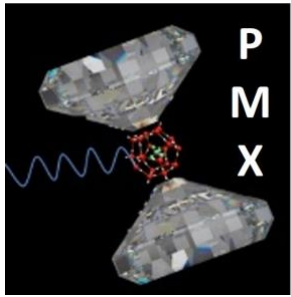



M2 – SMNO-nanomat – PMX

Title:	Physics of Materials under eXtreme conditions (PMX)	
	<p>Apogée code: MU5PYM12</p> <p>Number of credits: 6</p> <p>Teaching hours: 36h courses, 14h project</p>	

Lecturers:	<p>Sandra NINET (coordinator) IMPMC – 23-24 – 306 sandra.ninet@sorbonne-universite.fr</p>	<p>Frédéric DECREMPS IMPMC – 23-13 – 332</p>	<p>Daniele ANTONANGELI IMPMC - 23-13 - 305</p>
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Objectives	<ul style="list-style-type: none"> • Illustrate the concepts of physics / chemistry of condensed matter from an original point of view, with a specific regard to the effective applications. • Acquire the basic theoretical and experimental knowledge on the properties of solids and liquids under extreme thermodynamic conditions of high pressures and high temperatures
Content	<p>High-pressure fundamentals: theory and techniques</p> <ul style="list-style-type: none"> - Introduction to high-pressure research: why is it crucial to explore matter at extreme conditions? Experimental and theoretical challenges - Thermodynamics, phase diagram, equation of state of solids, pressure- and temperature-induced phase transitions, - High-pressure generation techniques and metrology; Diagnostics: X-ray and neutrons diffraction, vibrational spectroscopies (Raman, Infrared, Brillouin), inelastic scattering, ultrasonic techniques, simulations <p>Applications: physics, materials science, chemistry, geophysics and planetary sciences</p> <ul style="list-style-type: none"> - Atomic structure, long and short-range order, electronic properties and magnetism as a function of the density - High-pressure chemistry/physics and synthesis of new materials: high energy density materials, ultra-hard materials, high-temperature superconductors, superionic materials, nanocrystalline materials. - Matter under conditions of planetary interiors: from Earth to Jupiter! <p>Special practical works (proposed in LabS) will be specifically dedicated to PMX students</p>
Prerequisites	<ul style="list-style-type: none"> - Physics of solid / basics in quantum physics - Basics in chemistry of solid - Thermodynamics / basics in statistical physics
Examination	<ul style="list-style-type: none"> - Bibliographical project and oral defense - Written final examination