Seminarium Departamentu Fizyki Materiałów

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Defect investigation in materials science using complementary experimental techniques and computational methods

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Defects have a strong impact on crystalline materials affecting their electrical, optical, mechanical, or chemical properties. Particularly noteworthy are defects that result from interactions of materials with ion beams, e.g., during the bombardment with fission products in nuclear reactors, due to exposure to cosmic radiation in space missions, or as a result of doping by ion implantation. It is crucial to understand the processes of damage formation and transformation to reduce its negative influence on device performance and lifetime. A combination of experimental and computational methods is one of the key ways to investigate defects in materials science. This talk will provide a selective presentation of the most common techniques used for that purpose, including Rutherford Backscattering Spectrometry in Channeling mode (RBS/C), X-ray Diffraction (XRD), micro-Raman spectroscopy, Transmission Electron Microscopy (TEM), and Particle-Induced X-ray Emission as well as Molecular Dynamics and Monte Carlo simulations (McChasy code). I will discuss the features and complementarity of the techniques and show some examples of research on defects in selected nuclear materials and semiconductors.