

## Appunti di Fisica '22

**19 gennaio ore 15:30**

su Microsoft Teams "Seminari di Appunti di Fisica"

### Material Research with Ion and Neutron beams at Nuclear Physics Institute of CAS

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Nuclear analytical methods are powerful techniques employed mainly in materials science for the preparation, modification, and analysis of samples. At the Nuclear Physics Institute of the Czech Academy of Sciences in Rez near Prague, various advanced nuclear techniques using ion and neutron beams are performed using the 3 MV accelerator Tandetron 4130 MC (HVEE) and 10 MW nuclear research reactor LVR-15 (CEZ).

In this seminar, several experiments, recently performed by our group, will be presented to introduce a) the material modification of thin films by energetic ions and b) their characterization by ion beam (IBA) and neutron beam (NBA) analytic methods. In the first example, the IBA characterization of thin films of the so-called MAX phases, prepared by ion beam sputtering on a newly installed multipurpose Low Energy Ion Facility (LEIF), will be applied for investigation of the thin film radiation tolerance. Additionally, specific structural and mechanical properties of these ternary composites, will be briefly discussed.

The second example will be focused on the study of thin All-Solid-State Li-Ion Batteries (ASSLIBs), using the non-destructive method of NDP (Neutron Depth Profiling). Thermal neutron beam necessary for this experiment is provided by our recently upgraded neutron guide. The NDP method was able to monitor the migration of Li ions between the electrodes via a solid electrolyte in ASSLIBs (thickness of 1  $\mu\text{m}$ ). The study showed that, in contrast to other established methods, NDP can analyze the distribution and total volume of Li ions in operando when charging or discharging the batteries.