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Local effects in vanadia-based compounds

The current study focuses on the temperature-dependent structural modulation of the local environment of M^{2+} ions in vanadium bronzes MxV_2O_5 and vanadates $xMnO-V_2O_5$. The growing interest in V_2O_5 -based materials is in view of their potential for cathodes in M ion batteries, as highlighted in recent research [1]. Although the (de)intercalation mechanism of M ions is considered fundamental to charge transfer [2], a detailed description of this process is still lacking. In this regard, it becomes interesting to investigate vanadia-based materials with local methods, such as Time-Differential Perturbed Angular Correlation (TDPAC) spectroscopy to gain deeper insights into the structural dynamics involved. Samples were synthesized using incipient wetness impregnation method and the standard Pechini route. The X-ray diffraction method was employed to control over sample quality. For TDPAC measurements, the radioactive probes were introduced either through ion implantation of ^{111m}Cd beam at ISOLDE or directly during synthesis using $^{111}InCl_3$ sourced from IPEN-Brazil. The behavior of hyperfine parameters indicates a temperature-dependent modulation of the local environment of the Cd probes in both $V_2O_5: Cd$ and $xMnO-V_2O_5: Cd$ systems. The observed effect can be associated to either distortions induce by the probe atom; or to intrinsic local structural variation. The two possibilities will be discussed in this presentation.

Work-package

Facility identifier

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