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Local effects in vanadia-based compounds

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The current study focuses on the temperature-dependent structural modulation of the local environment of M2+ ions in vanadium bronzes MxV2O5 and vanadates xMnO-V2O5. The growing interest in V2O5-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 111mCd beam at ISOLDE or directly during synthesis using 111InCl3 sourced from IPEN-Brazil. The behavior of hyperfine parameters indicates a temperature-dependent modulation of the local environment of the Cd probes in both V2O5:Cd and xMnO-V2O5:Cd systems. The observed effect can be associated to either distortions induce by the probe atom; or to intrinsic local structural variation.

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