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Study of Sn and Fe based electrode materials for Alkali-ion batteries by in situ Mössbauer spectroscopy

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Li-ion batteries are widely used for electrochemical energy storage, because of their high energy density and efficiency. The most significant challenges in the development of advanced Li-ion batteries concern the electrode materials. Indeed, the electrodes properties critically determine the capacity, performance, and durability of alkali-ion batteries.
In the past five decades, Mössbauer spectroscopy has been an important analytical technique for investigating the structural, magnetic and electronic properties of energy materials. Mössbauer spectroscopy allows simultaneous investigation of bulk and surface characteristics. It is a non-destructive technique that can follow the behavior of electrode materials during the reaction process in situ and operando [1]. Its high resolution enables the observation of all Mössbauer active phases and the measure of their relative quantities .
Iron and tin containing materials are of considerable interest as electrode material for Li-ion batteries [2, 3]. In this presentation, we report in situ and operando measurements of new electrode materials based on Fe and Sn during electrochemical cycling by combining Mössbauer spectroscopy with complementary techniques (X-ray diffraction, magnetic measurements, impedance spectroscopy, etc.) to study and investigate the electrochemical behavior of the electrode materials.

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