Mössbauer spectroscopy for electrochemical energy storage and conversion materials.

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Abstract:
In the last decade, there is reportedly a marked growth in the number of Mössbauer spectroscopy studies covering electrochemical energy storage and conversion applications.[1] As in other Material Science branches, this technique has been very useful in the optimization of the synthesis of innovative materials containing common Mössbauer isotopes such as ^{121}Sb[1], ^{119}Sn[2] and more frequently ^{57}Fe[3-5]. Nowadays, *operando* Mössbauer spectroscopy is routinely used for the investigations of the electrochemical mechanisms of electrode materials. In this presentation, we will see how Mössbauer spectroscopy has become indispensable for optimizing the synthesis routes as well as the performance of functional materials. Through examples from our group and other published works, the role and the importance of this technique in battery studies will be highlighted.

The topical cases of several iron and tin electrode materials, such as $LiFe_{1-x}Mn_xSO_4F$, $LiFe_{1-x}Mn_xPO_4$ and TiSnSb, will be highlighted Among them, one of the newest cathode materials $LiFeSO_4F$ is a pedagogic example showing the role that can be played by Mössbauer spectroscopy in the synthesis, the characterization, and the fabrication of polymer electrodes[6].

In their quest for affordable alternatives to platinum group metals, chemists have recently focused their efforts on new materials based on common transition metals such as iron and cobalt as catalysts for the conversion of chemical energy to electrical energy. Hence many iron based systems have been proposed as serious candidates to make next generation fuel cell electrodes. After a general review of iron based fuel cell catalytic materials, a more detailed overview of the Fe-N-C system considered as one of the most promising ones will be given[7-8].

References:

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Contribution: Invited