Electron Spin Resonance as important tool for understanding the transition metal effect over Lamellar Metal Organic Framework during Charge/Discharge process

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Metal−organic frameworks (MOFs) are multi-functional porous materials, which have attracted great research interest in many fields, such as catalysis, gas storage, sensing, separation and drug delivery because of their structural diversity, tunable pore size (porosity, surface area, density), redox properties, simple synthetic processes, and low cost. The application of MOFs in lithium-ion batteries (LIBs) is currently a field of increasing attention.

LIBs have been broadly applied in portable electronics nowadays and have potential applications in hybrid electric vehicles. On the other hand, Sodium is the smallest alkali metal next to lithium and second-lightest alkali metal in the Periodic Table, which has similar chemistry with lithium. Sodium ion batteries (SIBs) have attracted increasing research interest recent years because of their wider resource abundance, lower cost of production, and higher system safety. Up to now, various kinds of electrode materials, including transition metal oxides, metal sulfides, and organic compounds, for SIBs have been extensively studied, which generally displayed high capacity; however, their long cycle stability still should be further improve in future for practical applications. Therefore, the designation of new alternative electrode materials as high performance anodes for SIBs and LIBs and investigation their electrochemical mechanisms are highly necessary. The development of Alkaline-ion batteries is closely associated with the use of new electrode materials, electrolytes.

Due to their high metal ion content MOFs can be investigated by magnetic spectroscopy techniques, among which Electron Spin Resonance (ESR) helps to elucidate the nature of paramagnetic probes including their interaction with diamagnetic and paramagnetic adsorbates in MOFs. In this work, was studied the effect of transition metal ions (Co, Ni, Mn, Cu) in lamellar metal organic framework and their use as the anode in ion batteries. These results were correlated with the electrochemical properties during charge/discharge process.

References:

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