

## Synchrotron X-ray spectroscopic techniques of Ni-Co based materials for electrochemical applications

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### Abstract

The Ni-Co based materials were successfully prepared by hydrothermal method for electrochemical applications. The physical/chemical properties and electrochemical performance were characterized and investigated by scanning electron microscopy (SEM), transmission electron microscopy (TEM), X-ray photoelectron spectroscopy (XPS), X-ray diffraction (XRD), synchrotron X-ray spectroscopy, and electrochemical techniques. The results evidenced that Ni-Co based materials could contribute to the optimization of electrochemical performance due to the existence of multiple redox couple species and unique special architectures, thus create more electrochemically active sites. These integrated properties offer a short electric/ionic transfer path for significant enhancement in electrochemical performance. The electrochemical mechanisms of Ni-Co based materials further explained by integrating electrochemical and synchrotron X-ray spectroscopy that give us a better understanding to elucidate the fundamental atomic/electronic structures of selected materials and further establish the possible dynamic electrochemical mechanisms during electrochemical processes. This work provides detailed insights into the future of electrochemical researches and perspectives in practical applications.

**Keywords - Ni-Co based materials, electrochemical applications, synchrotron X-ray spectroscopy.**