

Molecular Engineering of Hybrid Layered Double Hydroxides for Energy Applications

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Layered double hydroxides (LDHs) are a class of anionic clays with a layered structure, that can be exfoliated giving place in 2D materials. They have a great tunability regarding the metallic composition and the interlayer anion. Recently, these materials are attracting increasing attention from the point of view of their electrochemical performance towards energy storage and conversion applications, highlighting mainly their excellent performance as electrode materials in supercapacitors and electrocatalysts for the oxygen evolution reaction. [1]

On the one hand, we focused on deciphering the influence that the interlayer space has in the behaviour of NiFe(3:1)-LDHs as oxygen evolution reaction (OER) electrocatalyst. Increasing the basal space of the LDH results in a higher electrochemical surface area and a reduction of the resistance related to the chemisorption of oxygen leading to better kinetic behaviour. Indeed, the Tafel slope for the NiFe-LDHs with the highest basal space studied is similar to that obtained for benchmark exfoliated NiFe nanosheets and shows better stability as a consequence of the tridimensional robustness of the hybrid material. However, an excessive increment of the interlayer space compromises the onset potential. [2]

On the other hand, it was investigated the influence of the interlayer space and the metallic ratio in the specific capacitance of a CoAl-LDH family when used as electrode materials for supercapacitors. Best specific capacitances were achieved for the lowest Co(II)/Al(III) ratio revealing the role of the electrochemically inert Al in the structure. In addition, the specific capacitance increases with the basal space, achieving an improvement of 46 % in the specific capacity for the CoAl(2:1)-LDH. This enhancement is ascribed to the increment of the electrochemical surface area. [3]

Figures

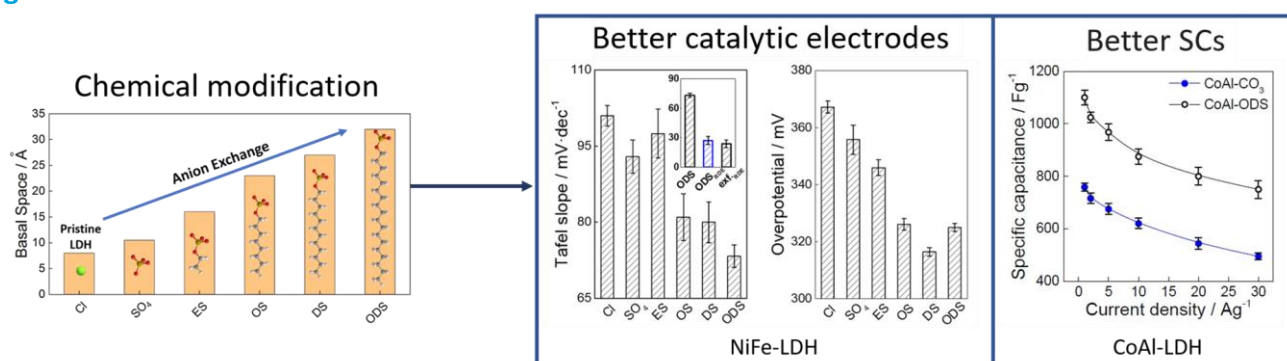


Figure 1: Influence of the Layered Double Hydroxides Interlayer Space on energy applications.

References

- [1] Dionigi, F.; Strasser, P. *Advanced Energy Materials* 2016, 6 (23), 1600621.
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