

Solution-processed Layered Double Hydroxides for Energy Applications

Marco Piccinni^{1,2}

Sebastiano Bellani³, Gabriele Bianca^{1,2}, Francesco Bonaccorso^{2,3}

¹ Dipartimento di Chimica e Chimica Industriale, Università degli Studi di Genova, via Dodecaneso 31, 16146 Genoa, Italy.

² Istituto Italiano di Tecnologia, Graphene Labs, via Morego 30, Genoa, Italy.

³ BeDimensional Spa., via Lungotorrente Secca 3D, 16163 Genoa, Italy.

marco.piccinni@iit.it

Layered double hydroxides (LDHs) are a class of anionic clays consisting of positive charged brucite-like layers spaced by water molecules and counterbalancing anions[1]. In particular, transition metals LDHs have drawn attention for energy storage and conversion applications[2] because of their electrocatalytic and photocatalytic properties[3][4]. Contrarily to other layered materials[5], LDH layers are held together by electrostatic forces and a dense network of hydrogen bonds[1]. For these reasons, a careful choice of solvent capable to break hydrogen bonds is pivotal for an efficient exfoliation of the LDHs. One of the most effective solvent for LDHs exfoliation is formamide[6]. However, due to formamide toxicity and its high boiling temperature (210°C), other solvents are recommended for the processing of LDHs[7]. In our work, we report that the presence of both acetate and citrate anions during the synthesis of nickel-iron layered double hydroxide (NiFe-LDH) makes possible its exfoliation by simple shaking during the dispersion in ethanol. The formation of single-layer nanosheets is confirmed by X-ray diffraction (XRD) and atomic force microscopy (AFM) data. Lastly, the investigation of NiFe-LDH as electrocatalyst for the OER is showing promising performances for practical applications.

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FIGURES

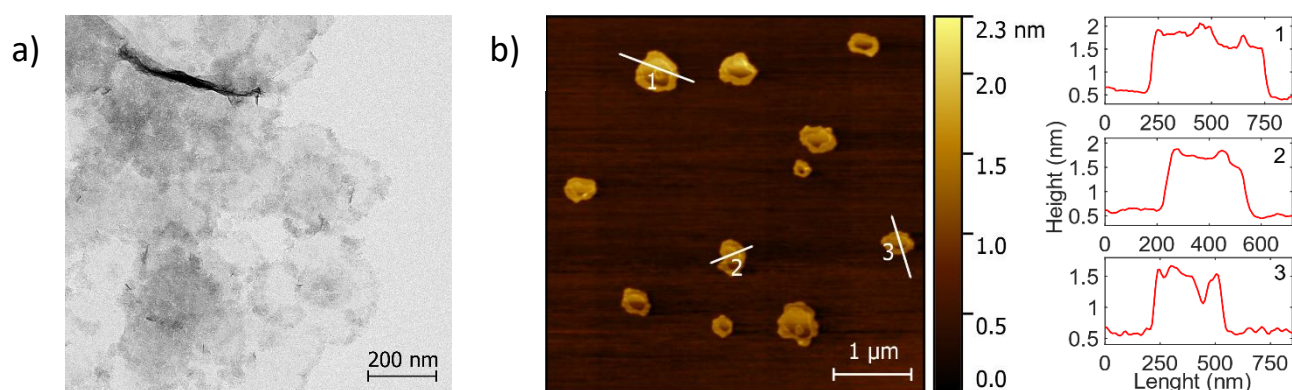


Figure 2: a) Transmission electron microscopy image of citrate containing NiFe-LDH nanosheets. b) Atomic force microscopy image and height profiles of NiFe-LDH nanosheets deposited on mica.

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