Namur Institute of Structured Matter

Chemistry and Electrochemistry of Surfaces

UNIVERSITÉ DE NAMUR

NISM Seminar

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« 1D, 2D and 3D Nanostructured Materials for Energy Storage and Biosensing »

When and where:

Thursday November 7th 2019 at 10:40
UNamur, Rue Grafé 2, B-5000 Namur
Chemistry & Physics building
Academic room (5th floor)

« 1D, 2D and 3D Nanostructured Materials for Energy Storage and Biosensing »

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Material properties such as size, contact surface area and crystallinity have a profound effect on the electroactive material performance in numerous applications especially those related to energy storage, catalysis, biosensing and environment. Therefore, more environmentally friendly, faster and energy-efficient synthesis methods for nanoparticle production are currently of interest; especially for transition metal hydroxide nanoparticles and nanostructured carbon. Thus, developing the transition metal hydroxide and carbonate hydroxide nanomaterials, particularly those composed of Ni, Co, Fe, Zn, Mn which are less expensive replacements for noble electroactive metals, have attracted considerable attention, among researchers in recent years. This is because of their earth abundant nature, low cost, environmentally friendly, multiple valence state and high theoretical activity among other faradic materials.

Based on the earlier ideas postulated by researchers on designing and developing electrode materials with reasonable electrochemical properties, we present in this contribution some results obtained in our LEREC laboratory throught the successful synthesis of mono-, bi- and ternary transition metallic hydroxides based of Ni, Co, Mn, Fe and Zn with carbonate $(CO_3)^{2-}$ and/or hydroxide $(OH)^-$ intercalated ions. These micro/nanosystems were synthesized using a free-template one-step hydrothermal method, depicting a simple, efficient and low cost growth route. We will also present some results from in-situ hydrothermal growth Hydroxides/Graphene or MWNTs nanohybrids. We studied the effect of hydrothermal parameters (growth temperature, synthesis time as well as the transition metal precursors ratio) on the formation of different kind of electroactive morphologies such as : nanofiber/nanoneedle, nanosheet or urchin-like forms corresponding 1D, 2D and 3D structures, respectively. The as-obtained hydroxides and oxides were quantitatively and qualitatively characterized using different techniques, such as: XRD and FTIR (structural identification), BET (textural/porosity properties), FE-SEM and HRTEM (morphological aspect) as well as XPS spectroscopy.

References :

[1] O. Guellati et al., Electrochimica Acta, vol. 275 (2018) 155-171. DOI : 10.1016/j.electacta.2018.04.112

[2] H. Kennaz et al., J Solid State Electrochem, vol. 22 (2018) 835-847. https://doi.org/10.1007/s10008-017-3813-y

[3] N. Habib et al., Applied Nanoscience (2019) 1-11. https://doi.org/10.1007/s13204-019-01062-w

[4] X. Bai et al., Electrochemica Acta, vol. 215 (2016) 492-499.

[5] Z. Gao et al., J. of Colloid and Interface Science, vol. 534 (2019) 563-573.

[6] J. Li et al., NanoEnergy, vol. 57 (2019) 22-33.