

Poster Presentation

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Structural characterization of the of inorganic and organic hydrotalcites

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Layered double hydroxides are versatile materials used for intercalating bioactive molecules, both in pharmaceutical and cosmetic fields, with the purpose of protecting them from degradation, enhancing their water solubility to increase bioavailability, and/or obtaining modified release properties. Hydrotalcite is commercially available in its carbonate form, which is usually transformed into the nitrate form and finally exchanged by organic anions to obtain or regulate bioactivity or photo-activity effects (1). In this study all the steps of these transformations were characterized from the structural viewpoints by X-ray powder diffraction (XRPD) and automated electron diffraction tomography (ADT). ADT allowed shedding light on the nitrate position and conformation inside LDH. XRPD demonstrated at first that the presence of carbonate impurities is able to drive the intercalation of organic molecules into LDH, since CO₃²⁻-contaminated samples tend to assume d-spacings roughly multiple of LDH-CO₃ d-spacing. Finally XRPD was employed at in situ conditions to unravel the structural transformation occurring during the substitution of carbonate by nitrate ion and of the nitrate ion by organic anions. The carbonate-nitrate substitutions resulted to be very rapid (only few seconds) and only the use of a fast area detector, coupled to synchrotron radiation, allowed obtaining reliable patterns to perform XRPD refinement of the disordered structure at the sub-second time resolution. The nitrate-organic substitution resulted slower and depending on the chemical properties of the organic molecules.

[1] E. Conterosito, W. Van Beek, L. Palin, et al., *Crystal Growth & Design*, 2013, 13 (3), 1162–1169

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