

**Titolo: Exploring Different LDH Synthesis Approaches toward the Development of Bifunctional Materials for ICCU Applications**

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The development of efficient multifunctional materials is a key challenge for the implementation of Integrated Carbon Capture and Utilization (ICCU) technologies. Layered Double Hydroxides (LDHs) represent innovative precursors for the synthesis of bifunctional materials integrating CO<sub>2</sub> capture and catalytic functionalities. In this work, different LDH synthesis strategies, including conventional hydrothermal synthesis, microwave-assisted hydrothermal synthesis, and co-precipitation, were investigated to evaluate the influence of the preparation method on the physicochemical properties of the resulting materials. The synthesized samples were comprehensively characterized to assess their structural and morphological features, with particular attention to the relationship between the synthesis route and the materials properties

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