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PII: S1385-8947(18)31007-6
DOI: https://doi.org/10.1016/j.cej.2018.05.183
Reference: CEJ 19199

To appear in: *Chemical Engineering Journal*

Received Date: 3 March 2018
Revised Date: 29 May 2018
Accepted Date: 30 May 2018

Please cite this article as: M. Chen, G. Qu, W. Yang, W. Li, Y. Tang, Celgard Membrane-mediated Ion Diffusion for Synthesizing Hierarchical $Co(OH)_2$ Nanostructures for Electrochemical Applications, *Chemical Engineering Journal* (2018), doi: https://doi.org/10.1016/j.cej.2018.05.183

# Celgard Membrane-mediated Ion Diffusion for Synthesizing Hierarchical $Co(OH)_2$ Nanostructures for Electrochemical Applications

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Abstract: It remains a challenge to develop simple and mild strategies for synthesizing various $Co(OH)_2$ nanostructures on substrates. Inspired by semipermeable membranes, a Celgard membrane was used as an interface for separating components of the precursor solution and for ion exchange, to construct hierarchical $Co(OH)_2$ nanostructures. In contrast to traditional solvothermal reactions, this Celgard membrane-based method is simple and effective for preparing high-loading $Co(OH)_2$ array (density of approximately 7 mg $cm^{-2}$) on Ni foam. The permeability of the Celgard membrane was affected by the presence of an organic solvent. The morphology of $Co(OH)_2$ could be adjusted by controlling the $OH^-$ diffusion rate across the Celgard membrane. $OH^-$ was formed via the hydrolysis of