

Economic synthetic strategies for the optimization of cobalt oxides as water oxidation catalysts

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Artificial photosynthesis is a very promising method to harvest renewable energy. With sunlight, water is split into oxygen and hydrogen, which is storable or can be further converted into more convenient compounds. The main challenge of this method still remains the four electron transfer process of the water oxidation. Therefore, the development of efficient, stable and economic water oxidation catalysts (WOCs) is required. In this context, spinel-type Co_3O_4 attracts strong research interest as a low-cost and robust WOC^[1]. However, keeping full control over its various performance parameters, like crystallinity, oxidation states, morphology and surface area^[2], remains a preparative and analytical challenge. Therefore, the focus of this study is the cost efficient fast formation of spinel-type Co_3O_4 via short-time hydrothermal synthesis with quick regeneration options after prolonged periods of use. Furthermore, an efficient and low-cost cobalt oxide reference WOC formed under photochemical conditions is investigated and compared with state of the art WOCs in first economic analysis.

[1] M. Grzelczak, J. Zhang, J. Pfrommer, J. Hartmann, M. Driess, M. Antonietti, and X. Wang, *ACS Catal.*, **2013**, 3, 383–388.

[2] H. Liu and G. R. Patzke, *Chem. Asian J.*, **2014**, 9, 2249 – 2259.