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PII: S1385-8947(18)30330-9
DOI: https://doi.org/10.1016/j.cej.2018.02.117
Reference: CEJ 18596

To appear in: *Chemical Engineering Journal*

Received Date: 3 December 2017
Revised Date: 6 February 2018
Accepted Date: 26 February 2018

Please cite this article as: C. Jin, Y. Cui, G. Zhang, W. Luo, Y. Liu, Y. Sun, Z. Tian, W. Zheng, Synthesis of copper-cobalt hybrid oxide microflowers as electrode material for supercapacitors, *Chemical Engineering Journal* (2018), doi: https://doi.org/10.1016/j.cej.2018.02.117

Synthesis of copper-cobalt hybrid oxide microflowers as electrode material for supercapacitors

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Abstract

Copper-cobalt hybrid oxide (CuCoO-H) microflowers were prepared by a cost-effective and facile two-step growth-annealing approach toward supercapacitor electrode materials. The unique architecture obtained by adjusting the calcination atmosphere, ultrathin nanosheets with small nanocrystallites providing high specific surface area and appropriate mesoporous structure enhancing electrolyte penetration, as well as synergistic effect among $CuCo_2O_4$, Cu_2O and CoO makes the CuCoO-H display excellent electrochemical performances, showing the advantages of novel hybrid strategy, which shed new light on searching cheap and efficient electrode materials for supercapacitors. The CuCoO-H electrodes showed outstanding electrochemical stability, after 10000 cycles of measurements at a current density of 3 A g^{-1}, retaining 99.4% of the initial specific capacitances and impressive high-rate capability (405.36 F g^{-1} at 20 A g^{-1}). Furthermore, the CuCoO-H as the positive electrode and active carbon as the negative electrode constitute an asymmetric supercapacitor, exhibiting a high energy density of 32.2 W h kg^{-1} at the power density of 644 W kg^{-1}. At last, two asymmetric supercapacitors were assembled in series to light a red commercial light-emitting diodes (LEDs) for the practical application.