

## Supporting Information

### Nanostructured Cobalt Hydroxide Thin Films as High Performance Pseudocapacitor Electrodes by Graphene Oxide Wrapping

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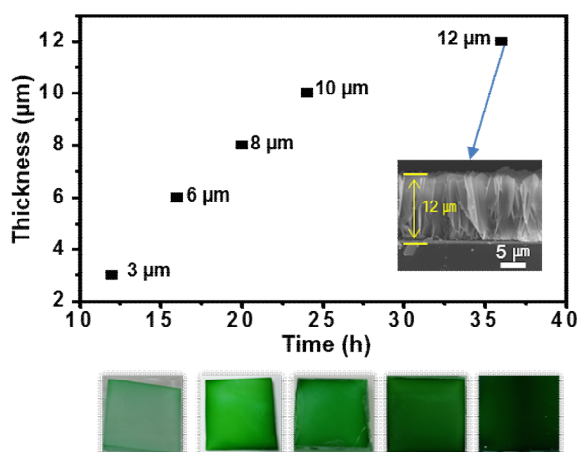


Figure S1. The growth rate of  $\alpha$ -Co(OH)<sub>2</sub> on FTO substrate.

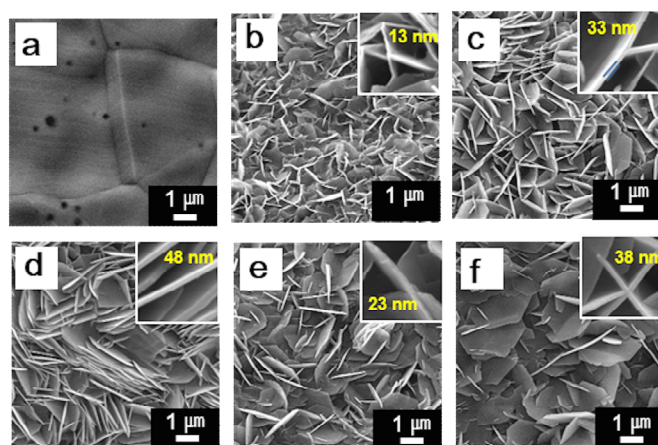


Figure S2. SEM images of bared nickel foam (a), and Co(OH)<sub>2</sub> after the reaction of 20 min (b), 40 min(c), 60 min(d), two depositions of 20 min (e), three depositions of 20 min (f).

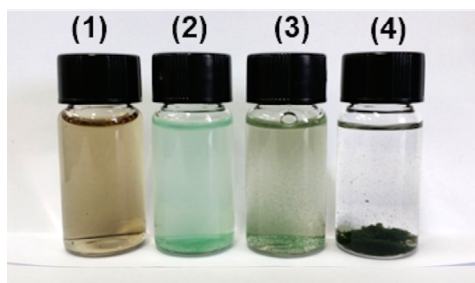


Figure S3. Photograph of GO (1),  $\text{Co(OH)}_2$  (2), just after mixing of GO with  $\text{Co(OH)}_2$  (3) and after 4 h of GO mixing with  $\text{Co(OH)}_2$  (4). All samples are dispersed in DI water.

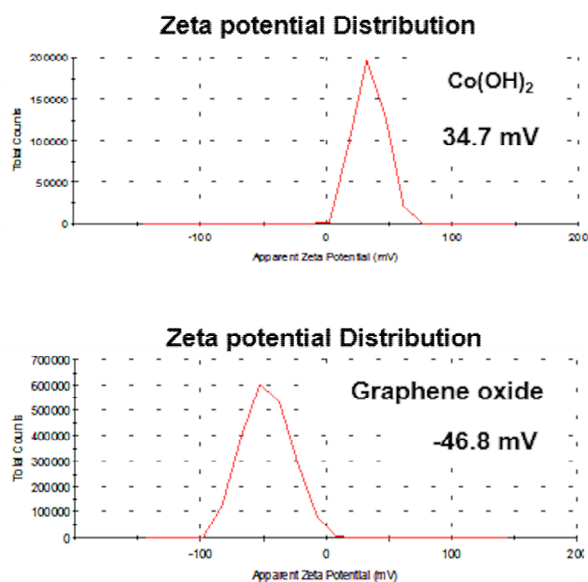


Figure S4. Zeta potential distribution of the GO and  $\text{Co(OH)}_2$  in DI water.

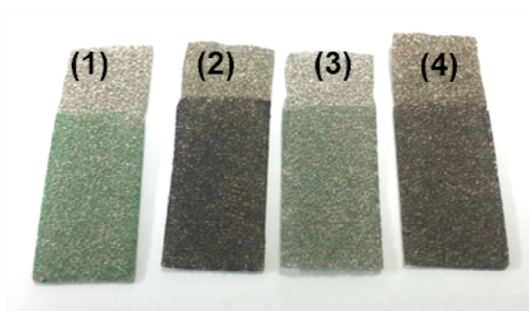


Figure S5. Photograph of  $\text{Co(OH)}_2$  on nickel foam (1);  $\text{Co(OH)}_2$  after 1000 cycling (2); GO wrapped  $\text{Co(OH)}_2$  (3); GO wrapped  $\text{Co(OH)}_2$  after 1000 cycling (4). All  $\alpha\text{-Co(OH)}_2$  were deposited for 6 h.

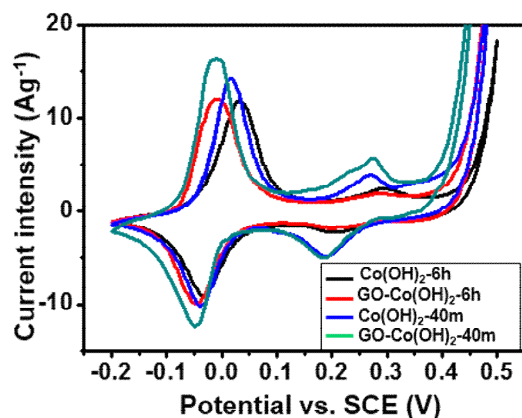


Figure S6. CV curves of  $\text{Co(OH)}_2$ -6h,  $\text{GO-Co(OH)}_2$ -6h,  $\text{Co(OH)}_2$ -40m and  $\text{GO-Co(OH)}_2$ -40m at scan rate of  $5 \text{ mVs}^{-1}$ .

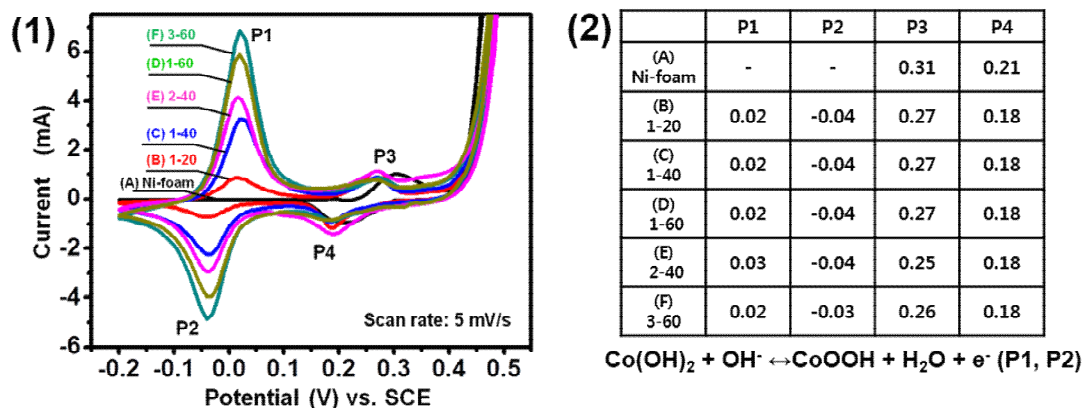


Figure S7.(1) CV curves of nickel foam (A) and  $\text{Co(OH)}_2$  after the reaction of 20 min (B), 40 min (C), 60 min (D), 40 min (two depositions of 20 min) (E), 60 min (three depositions of 20 min) (F). All samples were measured at scan rate of  $5 \text{ mVs}^{-1}$ . (2) The potential positions redox peaks in the left figure are summarized.

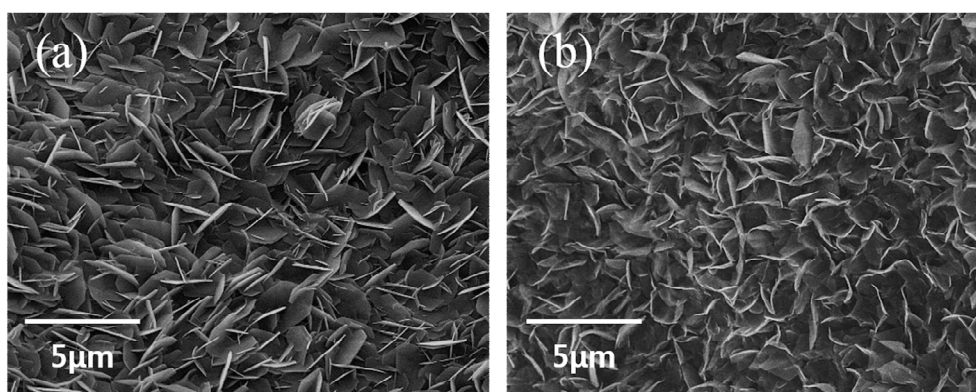


Figure S8. SEM images of  $\text{Co(OH)}_2$ -40m sample as-prepared (a) and after the two cyclic voltammeteries (b).

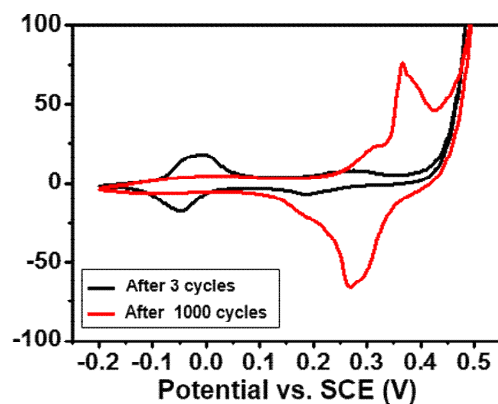


Figure S9. CV curves of  $\text{Co(OH)}_2$ -40m after 3 cycles and after 1000 cycles at scan rate of  $5 \text{ mVs}^{-1}$ .

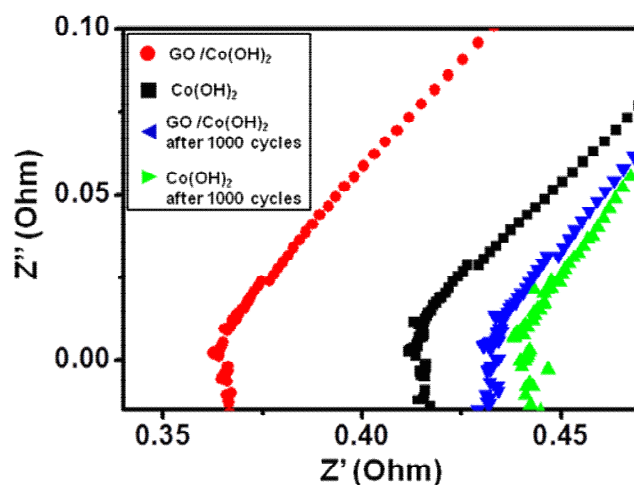


Figure S10. Nyquist plots of  $\text{Co(OH)}_2$  and  $\text{GO/Co(OH)}_2$  at high frequency regions.

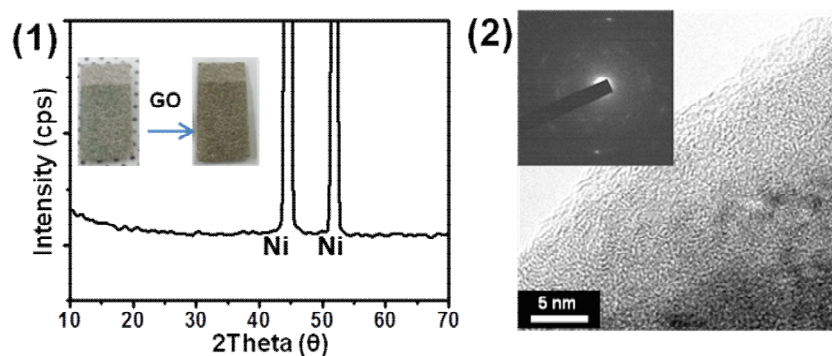


Figure S11. (1) XRD pattern of  $\text{GO wrapped Co(OH)}_2$  and photographs of  $\text{Co(OH)}_2$  samples before and after  $\text{GO}$  treating (inset). (2) HRTEM image and ED pattern (inset) of  $\text{GO wrapped Co(OH)}_2$ . All  $\text{Co(OH)}_2$  samples were deposited for 40 min (two deposition of 20 min).

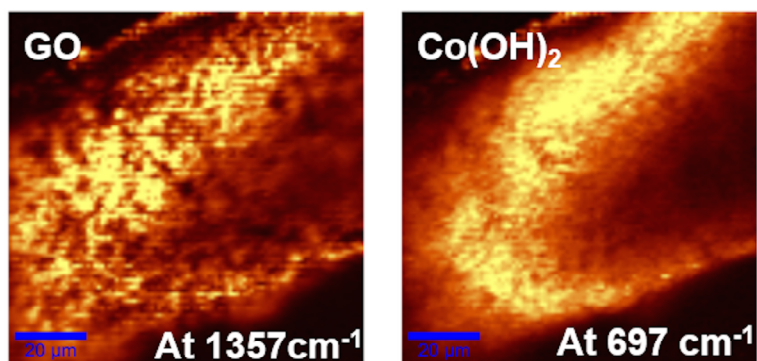


Figure S12. Raman spectroscopic mapping of Co(OH)<sub>2</sub>-6h at (a) 1357 cm<sup>-1</sup> and (b) 697 cm<sup>-1</sup>.

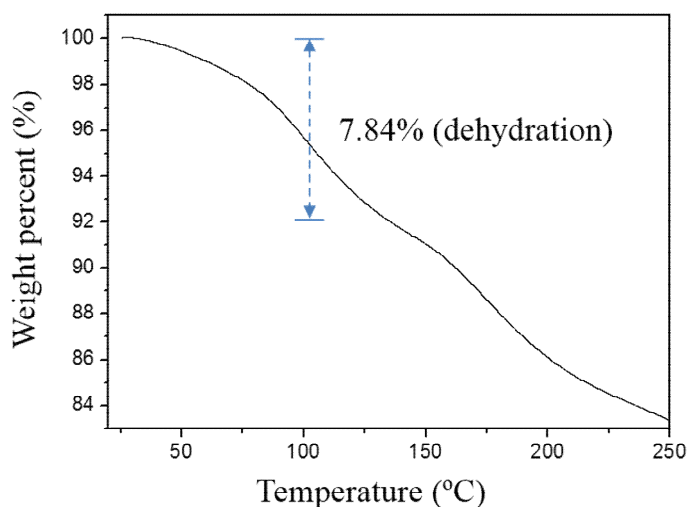


Figure S13. Thermo gravimetric curves of  $\alpha$ -Co(OH)<sub>2</sub> powder deposited for 6 h.

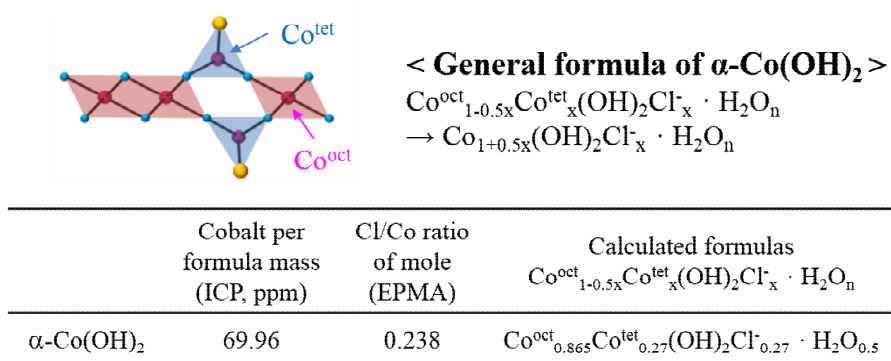


Figure S14. Suggested chemical composition of  $\alpha$ -Co(OH)<sub>2</sub> deposited for 6 h.

| Deposition methods                                              | 20 min         | 40 min | 60 min | 20 min<br>+<br>20 min | 20 min +<br>20 min +<br>20 min |
|-----------------------------------------------------------------|----------------|--------|--------|-----------------------|--------------------------------|
| Average thickness of<br>Co(OH) <sub>2</sub>                     | 14 nm          | 30 nm  | 47 nm  | 20 nm                 | 30 nm                          |
| Ratio of Co(OH) <sub>2</sub> redox peak<br>in CV curve (5 mV/s) | Less than 50 % | 90 %   | 96 %   | 95 %                  | 97 %                           |

Table S1. Co(OH)<sub>2</sub> peak ratios in CV curves as a function of deposition methods.