Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information for

Highly active and durable flowerlike Pd/Ni(OH)$_2$ catalyst for the electrooxidation of ethanol in alkaline medium

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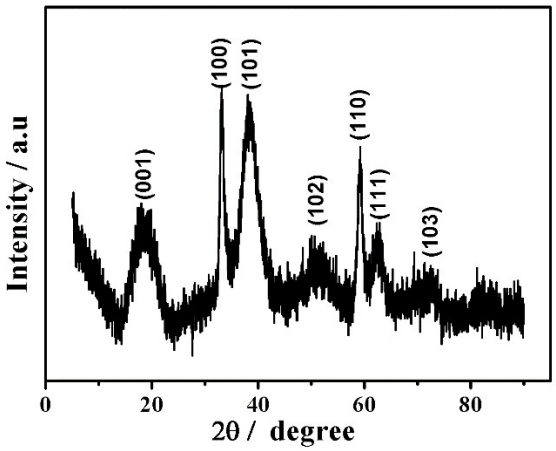

Figure S1. XRD patterns of the Ni(OH)$_2$ catalysts.

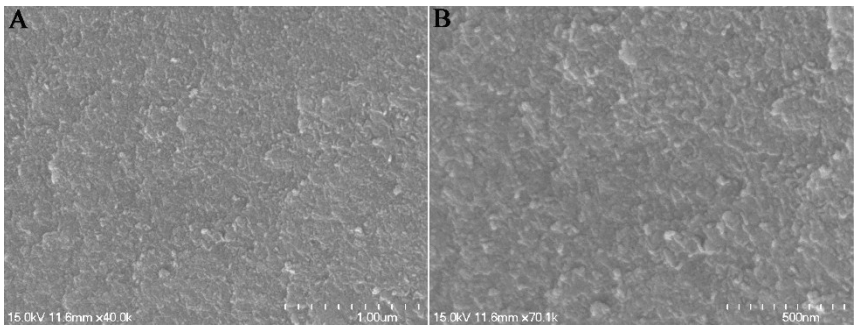

Figure S2. SEM images of Ni(OH)$_2$ with different magnification.

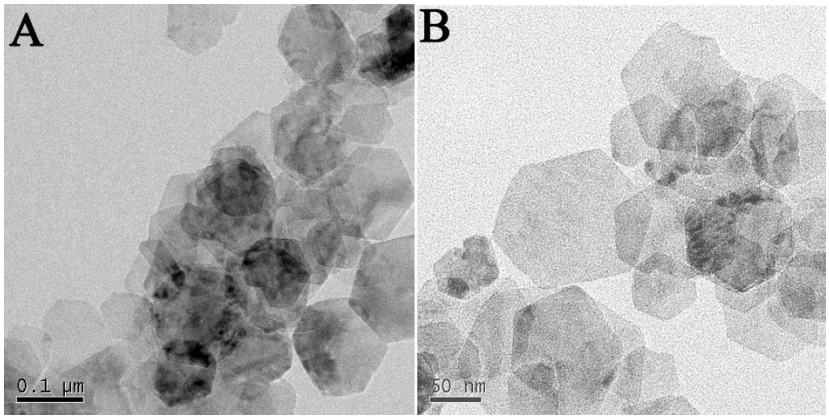

Figure S3. TEM images of $Pd/Ni(OH)_2$ with different magnification.

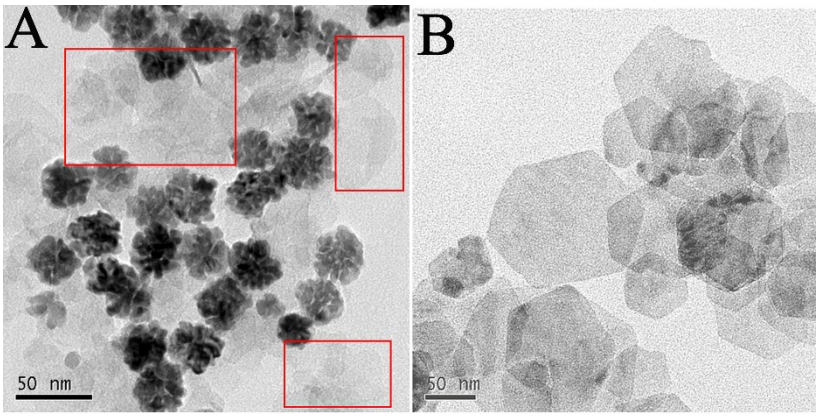

Figure S4. TEM images of (A)$Pd/Ni(OH)_2$ and (B)$Ni(OH)_2$.

We have marked $Ni(OH)_2$ in figure S4(A) captioned as Fig. 4(C) in the original manuscript. Moreover, in figure S4(B), we captured pure $Ni(OH)_2$ as reference. According to comparison, it proves that the shadows in Figure S4(A) are agreed with $Ni(OH)_2$ in morphology.

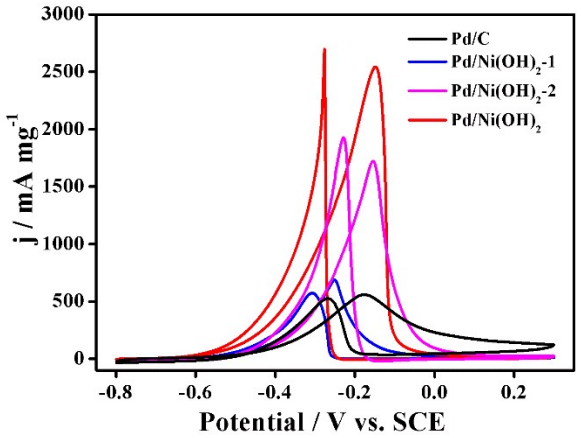

Figure S5. CV curves of commercial Pd/C, $Pd/Ni(OH)_2$-1, $Pd/Ni(OH)_2$-2 and

$Pd/Ni(OH)_2$ catalysts in solution containing 1 M KOH+1 M C_2H_5OH at the scan rate of 50 mV s^{-1}.

In order to investigate the effect of the content of Pd in the catalysts on the catalytic performance for ethanol electro-oxidation, the 10 mg, 20 mg and 30 mg of the $Ni(NO_3)_2 \cdot 6H_2O$ were added into reaction solution, respectively. They are denoted as $Pd/Ni(OH)_2$-1(43.0wt% of Pd, 36.2wt% of Ni, the percentage of the catalysts are theoretical value), $Pd/Ni(OH)_2$(27.3wt% of Pd, 46.0wt% of Ni) and $Pd/Ni(OH)_2$-2(20.1wt% of Pd, 50.5wt% of Ni), respectively. As demonstrated later, the best electrocatalyst for ethanol oxidation reaction is $Pd/Ni(OH)_2$, as shown Figure S5.

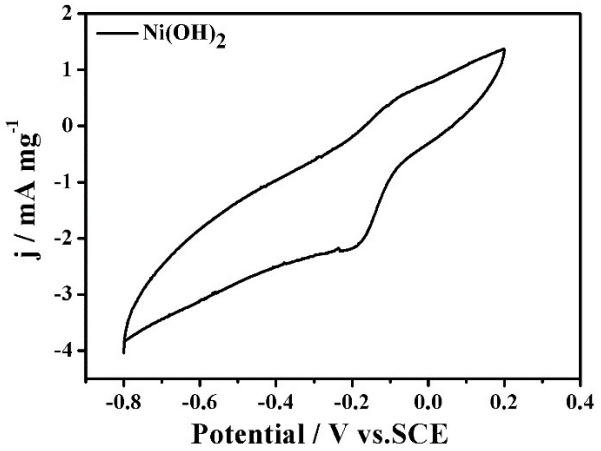

Figure S6. CV curves of $Ni(OH)_2$ catalyst in solution containing 1 M KOH+1 M C_2H_5OH at the scan rate of 50 mV s^{-1}.

As shown in Figure S6, in the process of the ethanol oxidation, the CV curve does not show the ethanol oxidation peak, indicating that each component of the hybrids fulfills an important specific role, Pd serves as the active sites for ethanol oxidation, $Ni(OH)_2$ provides abundant OH_{ads} species to facilitate the oxidative remove the adsorbed poisoning species (such as CH_3CO_{ads} and CO) on the surface of the Pd layers. As a result of the special surface and synergistic effects, the $Pd/Ni(OH)_2$ exhibited significantly improved electrocatalytic activity for ethanol electrooxidation.