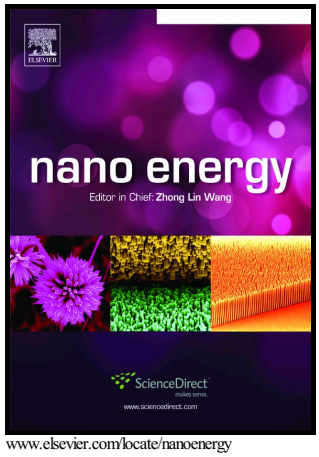

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PII: S2211-2855(18)30518-4
DOI: https://doi.org/10.1016/j.nanoen.2018.07.029
Reference: NANOEN2896

To appear in: *Nano Energy*

Received date: 10 May 2018
Revised date: 13 July 2018
Accepted date: 13 July 2018

Cite this article as: Ting-Wen Chen, Wei-Feng Huang, Jian-Xin Kang, Dong-Feng Zhang and Lin Guo, Cycling Potential Engineering Surface Configuration of Sandwich Au@Ni@PtNiAu for Superior Catalytic Durability, *Nano Energy,* https://doi.org/10.1016/j.nanoen.2018.07.029

Cycling Potential Engineering Surface Configuration of Sandwich Au@Ni@PtNiAu for Superior Catalytic Durability

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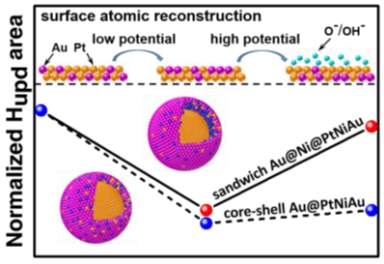
Abstract

We report the construction of Au@Ni@PtNiAu sandwich nanostructures of cycling-potential-responsive surface configurations as catalyst with simultaneous high activity and superior durability but minimized Pt usage. The atom migration tolerance of the amorphous Ni interlayer in the structure makes the Au segregated surface, which cause activity degradation by blocking active sites, easy to reverse back to Pt-dominated one after cycling under higher potential (0.6-1.4 V). The Pt-dominated surface with underneath sealed Au atoms gives the catalyst superior electrochemical activity and stability. Its specific activity towards methanol oxidation reaction (MOR, 2.05 mA cm^{-2}) is as high as 6 times of commercial Pt/C (0.33 mA cm^{-2}). Both the electrochemically active surface area (ECSA) and MOR activity experience no loss but a slight increase after as long as 10000 cycles in 0.5 M H_2SO_4 under the potential of 0.6-1.4 V. The comparison with Au@PtNiAu core-shell structure reveals the Ni interlayer also serves as a source to compensate the possibly dissolved Ni in the PtNiAu shell during the electrochemical process and thus ensures the well-maintained catalytic activity.

Graphical abstract



Sandwich structured Au@Ni@PtNiAu nanoparticles with ultra-low Pt-usage exhibit superior

[1] These authors contributed equally to this work.