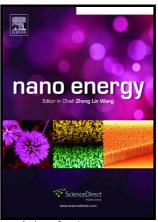
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ACCEPTED MANUSCRIPT

Multifunctional Pd-Sn Electrocatalysts Enabled by In Situ Formed SnO_x

and TiC Triple Junctions

Qizhi Dong, 1,*Mimi Wu, 1 Donghai Mei, 2Yuyan Shao, 2Yong Wang, 2,3 Jun Liu, 2,* Huizi Li, 1 and

Linyan Hong¹

¹State Key Laboratory of Chemo/Biosensing and Chemometrics, College of Chemistry and Chemical

Engineering, Hunan University, Changsha 410082, PR China

²Pacific Northwest National Laboratory, Richland WA 99352, USA

³The Gene and Linda Voiland School of Chemical Engineering and Bioengineering, Washington State

University, Pullman, WA 99164, USA

Email: qzhdong67@163.com (Q.D.), jun.liu@pnnl.gov (J.L.)

Abstract

This paper describes an in situ formed, triple junction structured PdSn electrocatalyst

dispersed on a stable conductive TiC surface. Through extensive characterization and

computational modeling, we show that the multicomponent catalyst forms a unique

PdSn/SnOx/TiC triple junction structure. This structure stabilizes Pd and promotes its

catalytic performance toward a model reaction, formic acid oxidation. Computational

modeling suggests that the triple junction structure is the most stable configuration that

provides desired anchoring sites for Pd and enables a favorable synergy between the

multicomponents Pd, Sn, SnO_x, and TiC for high activity. The triple junction structure also

can provide better stability against catalysts migration, detachment, or sintering.

Experimental measurements also confirm that multicomponent catalysts provide synergistic

functions. The intermediate products, CO_{ads}, prefer to adsorb onto the Pd sites, while the OH

prefers the Sn and SnO_x sites, which function together to prevent catalyst poisoning.

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