Supporting Information

Comparison of electrocatalytic activity of Pt$_{1-x}$Pd$_x$/C catalyst for ethanol electro-oxidation in acidic and alkaline media

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Fig. S1 CO stripping voltammograms of Pt$_{1-x}$Pd$_x$/C catalysts in 0.5 M H$_2$SO$_4$ solution.
Table S1. Comparison of ethanol oxidation behavior on the Pt\textsubscript{1-x}Pd\textsubscript{x}/C composites and recent state-of-the art Pt or Pd-based electrocatalysts.

| Catalysts          | \( j_f \) (mA mg\(^{-1}\)) | Electrolyte                               | Reference |
|--------------------|-------------------------------|-------------------------------------------|-----------|
| PdCoNTAs\(^a\)/CFC\(^b\) | 1500                          | 1.0 M C\(_2\)H\(_5\)OH + 1.0 M KOH       | 1         |
| Pd PNs \(^c\)/VXC   | 1300                          | 1.0 M C\(_2\)H\(_5\)OH + 0.5 M NaOH      | 2         |
| Pd@CoPNS\(^d\)/CFC  | 1413.3                        | 1.0 M C\(_2\)H\(_5\)OH + 1.0 M KOH       | 3         |
| PdAg-HNs \(^e\)     | 1615.9                        | 1.0 M C\(_2\)H\(_5\)OH + 1.0 M KOH       | 4         |
| Pd/PANI/Pd          | 350                           | 1.0 M C\(_2\)H\(_5\)OH + 1.0 M KOH       | 5         |
| SNTAs \(^f\)        |                               |                                           |           |
| PdCu\(_2\)          | 1630                          | 1.0 M C\(_2\)H\(_5\)OH + 1.0 M KOH       | 6         |
| Pd-Sn ANSDs \(^g\)  | 576                           | 1.0 M C\(_2\)H\(_5\)OH + 1.0 M KOH       | 7         |
| PdNi/C              | 450                           | 0.5 M C\(_2\)H\(_5\)OH + 0.1 M KOH       | 8         |
| Pd\(_{45}\)Pt\(_{55}\) | ~950                          | 1.0 M C\(_2\)H\(_5\)OH + 0.5 M NaOH      | 9         |
| nanowires/GCE\(^h\) |                               |                                           |           |
| PdAg BANWs \(^i\)   | 1970                          | 1.0 M C\(_2\)H\(_5\)OH + 1.0 M KOH       | 10        |
| Pt-based electrocatalysts                      |                               |                                           |           |
| Pt/C+20 wt.%TiO\(_2\) | 647.6                         | 1.0 M C\(_2\)H\(_5\)OH + 1.0 M HClO\(_4\) | 11        |
| PtRu/C              | 1200                          | 1.0 M C\(_2\)H\(_5\)OH + 1.0 M KOH       | 12        |
| Pt/3DGF\(^j\)       | 1406                          | 1.0 M C\(_2\)H\(_5\)OH + 1.0 M KOH       | 13        |
| PtCu/C              | 1200                          | 0.1 M C\(_2\)H\(_5\)OH + 0.3 M KOH       | 14        |
| Pt-Pd/C             | 100                           | 1.0 M C\(_2\)H\(_5\)OH + 0.1 M HClO\(_4\) | 14        |
| Pd\(_{45}\)Pt\(_{55}\) | 900                           | 1.0 M C\(_2\)H\(_5\)OH + 0.5 M NaOH      | 15        |
| PtCu nanocone alloy | 320                           | 0.1 M C\(_2\)H\(_5\)OH + 0.5 M H\(_2\)SO\(_4\) | 16        |
| Pt-Ru/C             | 201.23                        | 0.5 M C\(_2\)H\(_5\)OH + 0.1 M H\(_2\)SO\(_4\) | 17        |
| Pt\(_{1}\)Ru\(_{1}\)-RGO | 1194                          | 1.0 M C\(_2\)H\(_5\)OH + 1.0 M KOH       | 18        |
| Pt\(_{34}\)Pd\(_{32}\)Cu\(_{33}\) | 190                           | 0.5 M C\(_2\)H\(_5\)OH + 0.1 M HClO\(_4\) | 19        |
| Pt-CeO\(_2\)-MWCNT   | 1410                          | 1.0 M C\(_2\)H\(_5\)OH + 1.0 M KOH       | 20        |
| Pt\(_{25}\)Pd\(_{77}\)/C | 2453.7                        | 1.0 M C\(_2\)H\(_5\)OH + 1.0 M KOH       | This work |

\(^a\)NTAs: nanotube arrays; \(^b\)CFC: carbon fiber cloth; \(^c\)PNPs: porous nanoparticles; \(^d\)NSs: nanosheets; \(^e\)HNs: hollownanoflowers; \(^f\)SNTAs: sandwich structured nanotube arrays; \(^g\)ANSDs: alloy nanosheet dendrites; \(^h\)GCE: glass carbon electrode; \(^i\)BANWs: bimetallic alloy networks; \(^j\)NPNCs: N-dopedporous carbon nanocapsules; \(^3\)DGF: 3D graphene framework

REFERENCES

1 A. L. Wang, X. J. He, X. F. Lu, H. Xu, Y. X. Tong and G. R. Li, Angew. Chem.
Int. Ed., 2015, 54, 3669-3673.

2 W. Hong, Y. Fang, J. Wang and E. Wang, J. Power Sources, 2014, 248, 553-559.

3 S. H. Ye, J. X. Feng and G. R. Li, ACS Catal., 2016, 6, 7962-7969.

4 D. Bin, B. Yang, K. Zhang, C. Wang, J. Wang, J. Zhong, Y. Feng, J. Guo and Y. Du, Chemistry, 2016, 22, 16642-16647.

5 A. L. Wang, H. Xu, J. X. Feng, L. X. Ding, Y. X. Tong and G. R. Li, J. Am. Chem. Soc., 2013, 135, 10703-10709.

6 J. Xue, G. Han, W. Ye, Y. Sang, H. Li, P. Guo and X. S. Zhao, ACS Appl. Mater. Interfaces, 2016, 8, 34497-34505.

7 L. X. Ding, A. L. Wang, Y. N. Ou, Q. Li, R. Guo, W. X. Zhao, Y. X. Tong and G. R. Li, Sci. Rep., 2013, 3, 1-6.

8 K. Lee, S. W. Kang, S. U. Lee, K. H. Park, Y. W. Lee and S. W. Han, ACS Appl. Mater. Interfaces, 2012, 4, 4208-4214.

9 C. Zhu, S. Guo and S. Dong, Adv. Mater., 2012, 24, 2326-2331.

10 S. Fu, C. Zhu, D. Du and Y. Lin, ACS Appl. Mater. Interfaces, 2015, 7, 13842-13848.

11 L. Yu and J. Xi, Electrochim. Acta, 2012, 67, 166-171.

12 H. Gao, S. Liao, Z. Liang, H. Liang and F. Luo, J. Power Sources, 2011, 196, 6138-6143.

13 C. Hu, H. Cheng, Y. Zhao, Y. Hu, Y. Liu, L. Dai and L. Qu, Adv. Mater., 2012, 24, 5493-5498.

14 J. Maya-Cornejo, R. Carrera-Cerritos, D. Sebastián, J. Ledesma-García, L. G. Arriaga, A. S. Aricò and V. Baglio, Int. J. Hydrogen Energy, 2017, 42, 27919-27928.

15 C. Zhu, S. Guo and S. Dong, Adv. Mater., 2012, 24, 2326-2331.

16 F. Saleem, Z. Zhang, B. Xu, X. Xu, P. He and X. Wang, J. Am. Chem. Soc., 2013, 135, 18304-18307.

17 D. González-Quijano, W. J. Pech-Rodríguez, J. A. González-Quijano, J. I. Escalante-García, G. Vargas-Gutiérrez, I. Alonso-Lemus and F. J. Rodriguez-Varela, Int. J. Hydrogen Energy, 2015, 40, 17291-17299.

18 Q. Q. Xia, L. Y. Zhang, Z. L. Zhao and C. M. Li, J. Colloid Interface Sci., 2017,
506, 135-143.

19 J. Lan, K. Wang, Q. Yuan, X. Wang, *Mater. Chem. Front.* 2017, 1, 1217-1222.

20 M. Sedighi, A. A. Rostami, E. Alizadeh, *Int. J. Hydrogen Energy* 2017, 42, 4998-5005.