Supporting Information

for

Sinter-resistant catalyst using the alumina support recycled from AlP fumigation residue: trash to treasure

Jinshi Dong, a Jun Wang, a Jianqiang Wang, a Guanghao Cheng, a Tianming Huang, a

and Meiqing Shen a, b, c*

a Key Laboratory for Green Chemical Technology of State Education Ministry, School of Chemical Engineering & Technology, Tianjin University, Tianjin 300072, P.R. China

b State Key Laboratory of Engines, Tianjin University, Tianjin 300072, P.R. China

c Collaborative Innovation Center of Chemical Science and Engineering, Tianjin 300072, P.R. China

*Corresponding Authors: Tel./ Fax.: (+86) 22-27407002.
Email address: mqshen@tju.edu.cn (Prof. Shen)
Fig. S1 $^{31}$P NMR spectra of the samples treated with different conditions. 100.5 ppm was assigned to the chemical shift of P in AlP species, 2~5 ppm was assigned to the local structure of P in phosphate, which is similar to that in phosphoric acid.
Fig. S2 XRD patterns of the hydrolyzed samples (AlP-h) at different treatment conditions. a, 80 °C for 8 h; b, 80 °C for 15 h; c, 90 °C for 15 h. The AlN species could not be completely removed under all the hydrolysis treated conditions.
**Fig. S3** Al 2p and P 2p XPS spectra of the (a, b and c) fresh and (d, e and f) aged catalysts.
Fig. S4 (a) Activity tests of the fresh Pd/AIP-mh-800 and Pd/PB-800 catalysts. Feed gas stream: 2 % CO, 2 % O₂ and 5 % H₂O balanced with N₂ (flow rate: 1 L/min, 100 mg catalyst). The catalysts were reduced in 5 % H₂/N₂ at 200 ºC for 30 min before tests. (b) The changes of H₂O content during activity tests for both the fresh and aged catalysts.
Fig. S5 Representative TEM images of the aged catalysts after H₂ reduction. a, b and c, Aged Pd/AlP-mh-800. d, e and f, Aged Pd/PB-800.