## Design strategies for development of Pd-based acetylene hydrochlorination catalyst: Improvement of catalyst stability by nitrogen-containing ligands

Haihua He,<sup>a,b</sup> Jia Zhao,<sup>\*a</sup> Bolin Wang,<sup>a</sup> Yuxue Yue,<sup>a</sup> Gangfeng Sheng,<sup>a</sup> Qingtao Wang,<sup>a</sup> Lu Yu,<sup>a</sup> Zhong-ting Hu <sup>c</sup> and Xiaonian Li <sup>\*a</sup>

- a. Industrial Catalysis Institute, Laboratory Breeding Base of Green Chemistry-Synthesis Technology, Zhejiang University of Technology, Hangzhou 310014, China.
- b. Pharmaceutical and Material Engineering School, Jin Hua Polytechnic, Jinhua 321007, China.
- c. College of Environment, Zhejiang University of Technology, Hangzhou 310014, China.
- \* Correspondence: jiazhao@zjut.edu.cn (Jia zhao); xnli@zjut.edu.cn (Xiaonian Li); Tel.: +86 571 88320002.

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Catalysts	Pd loading	Reaction conditions (Temperature,GHSV,	Site Time Yield (STY)	Reference
PdCl <sub>2</sub> -KCl-LaCl <sub>3</sub> /C	0.9%	<sup>v</sup> <sub>HCl</sub> . v <sub>C2H2</sub> ) 180°C,120 h <sup>-1</sup> ,1.15	$(kg_{VCM}/kg_{Metal})$	[1]
Pd/NH <sub>4</sub> F-HY	0.90%	160°C, 110 h <sup>-1</sup> , 1.25	42	[2]
Pd-K/NFY	0.90%	160°C, 110 h <sup>-1</sup> , 1.25	41	[3]
Pd/PANI-HY	0.90%	160°C, 110 h <sup>-1</sup> , 1.25	40	[4]
PdCl <sub>2</sub> /C	0.64%	180°C, 1080 h <sup>-1</sup> , 1.1	55	[5]
Pd/HY	0.5%	160°C,110 h <sup>-1</sup> ,1.25	61	[6]
Pd-K/HY	0.5%	160°C, 110 h <sup>-1</sup> , 1.25	61	[7]
(NH <sub>4</sub> ) <sub>2</sub> PdCl <sub>4</sub> /AC	0.5%	100°C, 100 h <sup>-1</sup> , 1.2	58	This work
(NH <sub>4</sub> ) <sub>2</sub> PdCl <sub>4</sub> /AC	0.5%	160°C, 370 h <sup>-1</sup> , 1.2	137	This work

**Table S1.** The comparisons of catalytic performance between  $(NH_4)_2PdCl_4/AC$  and various Pd-based catalysts reported in literatures.

<sup>a</sup> STY  $(kg_{VCM}/kg_{Metal} \cdot h)$  was calculated as the average conversion of acetylene when the reaction reached steady state.

Sample	T peak (°C)	Area (H <sub>2</sub> )	H <sub>2</sub> consumed	Pd <sup>2+</sup> species (%)
PdCl <sub>2</sub> /AC	218	312ª	28.3 <sup>b</sup>	76.3
(NH <sub>4</sub> ) <sub>2</sub> PdCl <sub>4</sub> /AC	235	328	29.7	80.2

**Table S2.** Fitting parameters of H2-TPR profiles.

<sup>a</sup> The areas of the hydrogen consumption peak. <sup>b</sup> The amount of  $H_2$  consumed in µmol/g.



**Figure S1**. Procedure for the TPR area peaks determination: (a) details of the TPR profiles of the  $PdCl_2/AC$  catalyst ( $Pd^{2+}$  reduction) (b) the  $Pd^{2+}$  reduction peak was subject to baseline correction (c) a cumulative area counts in the interval 120 to 300 °C was carried out.

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