

## Accelerated hydrothermal ageing of Pd/Al<sub>2</sub>O<sub>3</sub> for catalytic combustion of ventilation air methane

Adi Setiawan,<sup>1,2</sup> Jarrod Friggieri,<sup>1</sup> Glenn Bryant,<sup>1</sup> Bogdan Z. Dlugogorski,<sup>3</sup> Eric M. Kennedy<sup>1</sup> and Michael Stockenhuber<sup>1\*</sup>

<sup>1</sup>*Priority Research Centre for Energy (PRCfE), Discipline of Chemical Engineering, School of Engineering, the University of Newcastle, Callaghan, NSW 2308, Australia*

<sup>2</sup>*Jurusan Teknik Mesin, Fakultas Teknik, Universitas Malikussaleh, Reuleut, Aceh Utara 24355, Indonesia*

<sup>3</sup>*School of Engineering and Information Technology, Murdoch University, Murdoch, WA 6150, Australia*

---

Keywords: Catalytic combustion; Methane; Palladium; Alumina; Hydrothermal ageing; Deactivation.

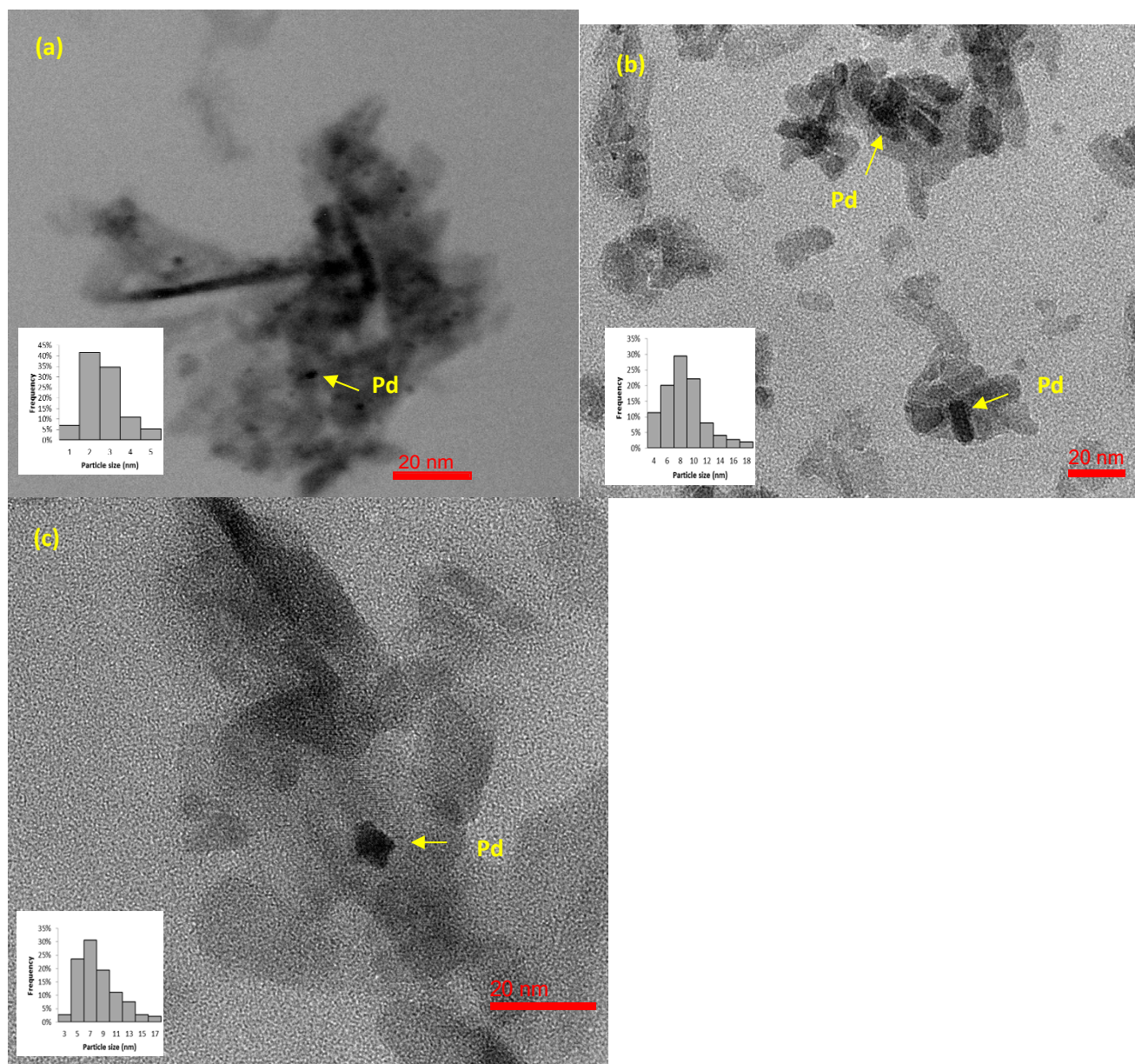


Fig. S1. TEM images of (a) fresh Pd/Al<sub>2</sub>O<sub>3</sub>; (b) used Pd/Al<sub>2</sub>O<sub>3</sub> from dry-VAM experiment; (c) used Pd/Al<sub>2</sub>O<sub>3</sub> from wet-VAM experiment;

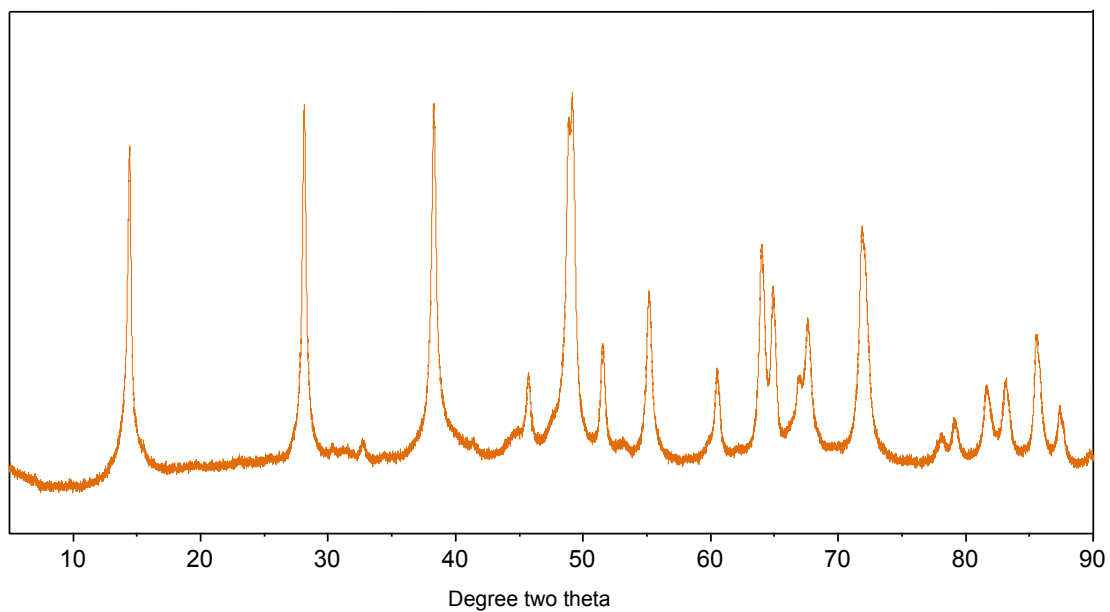


Fig. S2. XRD pattern of Pd/Al<sub>2</sub>O<sub>3</sub>-IV catalysts (aged 3 days in autoclave at 175 °C)

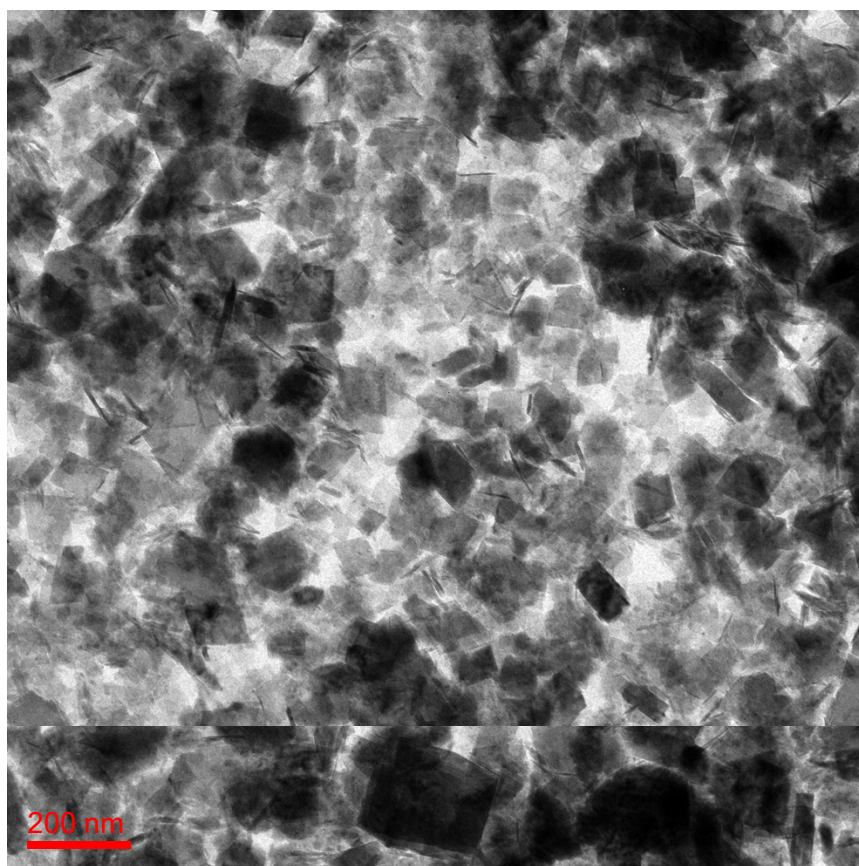


Fig. S3. TEM image of aged Pd/Al<sub>2</sub>O<sub>3</sub>-IV catalyst (aged in autoclave at 175 °C).



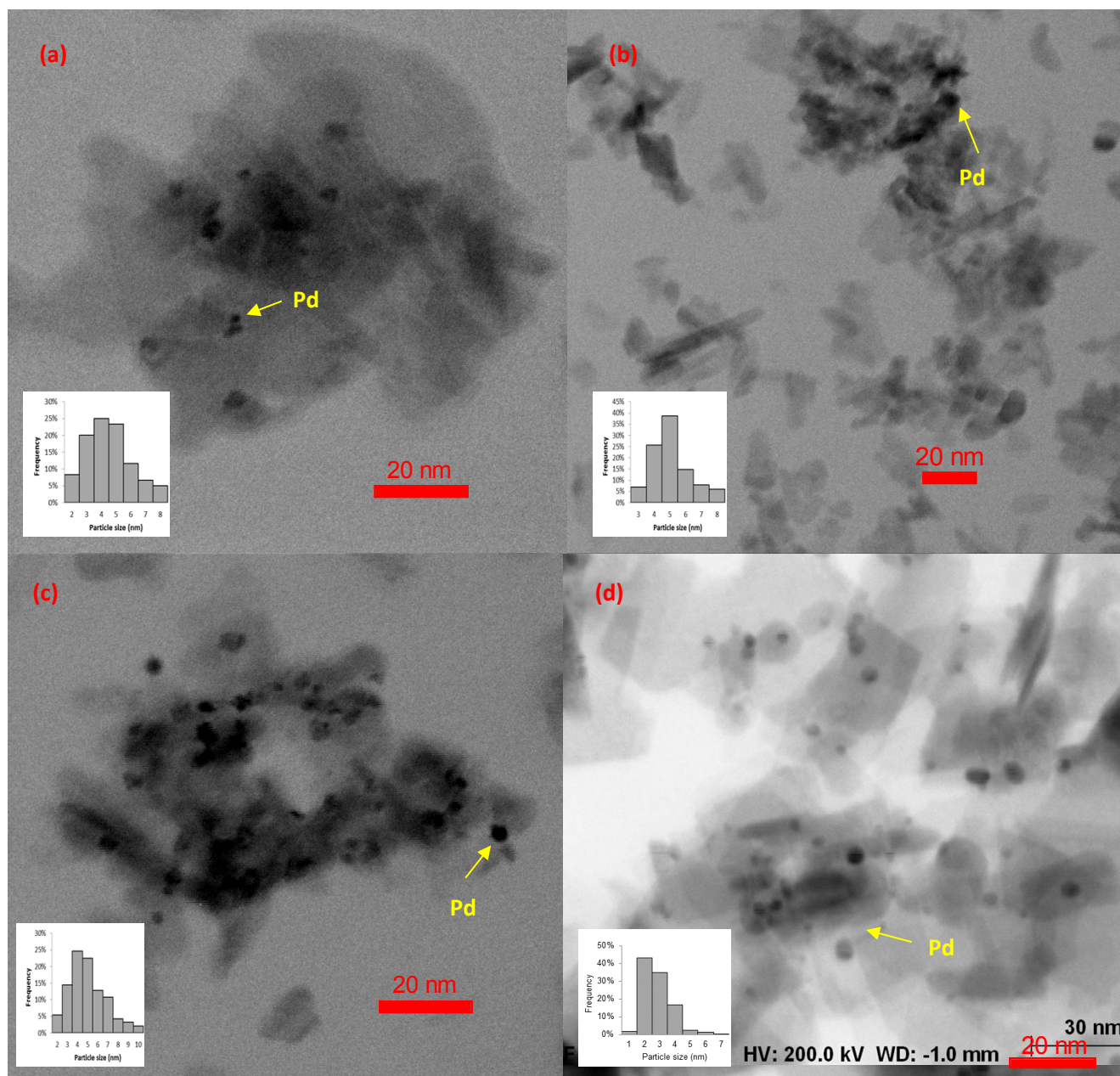


Fig. S4. TEM images of aged catalysts (a) Pd/Al<sub>2</sub>O<sub>3</sub>-I catalyst (aged 18 h in wet-feed at 780 °C); (b) Pd/Al<sub>2</sub>O<sub>3</sub>-II catalyst (aged 18 h in wet-feed at 830 °C); (c) Pd/Al<sub>2</sub>O<sub>3</sub>-III catalyst (aged 18 h in wet-O<sub>2</sub> at 780 °C); Pd/Al<sub>2</sub>O<sub>3</sub>-IV catalyst (aged in autoclave at 175 °C).