

Supplementary Information

Dynamics of CeO₂-Supported Pt Nanoparticles in CO Oxidation Reaction Revealed by Millisecond Time- Resolved HERFD-XANES Spectroscopy

Junya Ohyama,*¹ Mizuki Sato,² Masayuki Tsushida,³ Keisuke Awaya,¹
Masato Machida,¹ Tomoya Uruga,⁴ Kotaro Higashi*⁴

¹ Faculty of Advanced Science and Technology, Kumamoto University, Kumamoto 860-8555, Japan.

² Graduate School of Science and Technology, Kumamoto University, Kumamoto 860-8555, Japan.

³ Technical Division, Kumamoto University, Kumamoto 860-8555, Japan.

⁴ Japan Synchrotron Radiation Research Institute, 1-1-1 Kouto, Sayo-cho, Sayo-gun Hyogo, 679-5198, Japan.

* ohyama@kumamoto-u.ac.jp (JO), higashi@spring8.or.jp (KH)

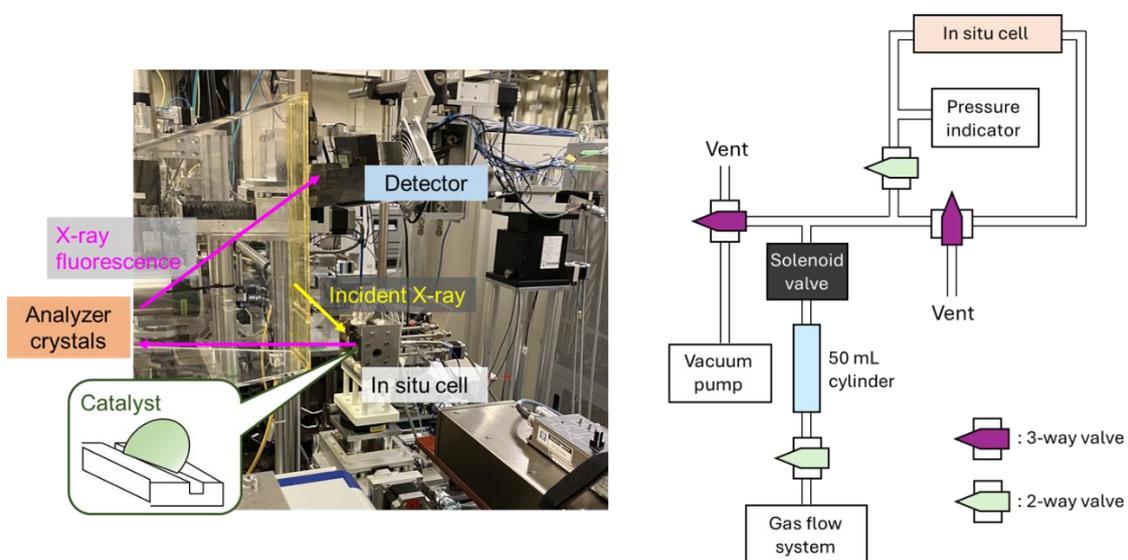


Figure S1. Experimental setup for the in situ HERFD-XANES measurement in this study.

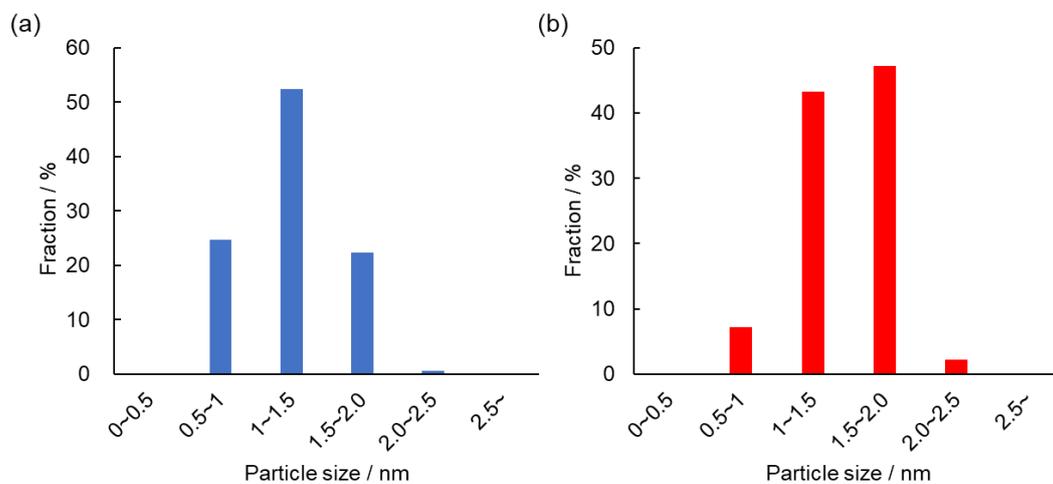


Figure S2. Size distribution of Pt nanoparticles in (a) Pt/CeO₂-700 and (b) Pt/CeO₂-900.

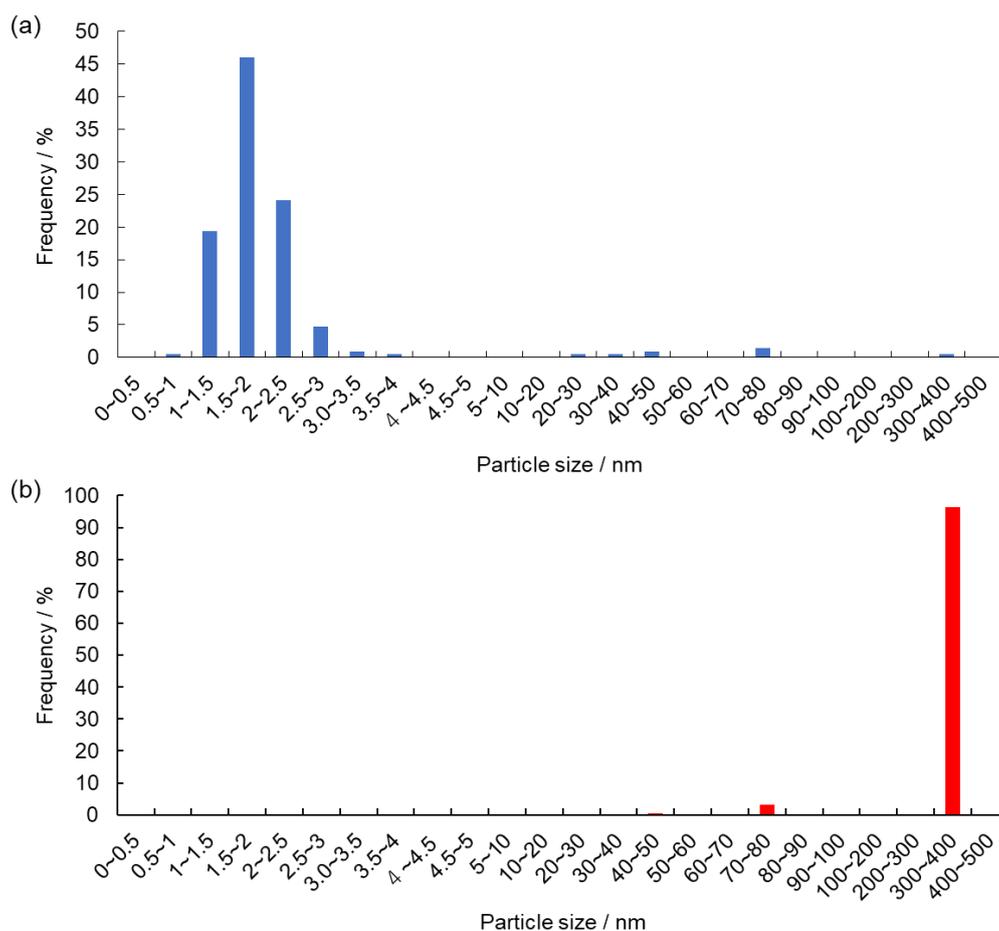


Figure S3. Volume-mean size distribution of Pt nanoparticles in (a) Pt/CeO₂-700 and (b) Pt/CeO₂-900.

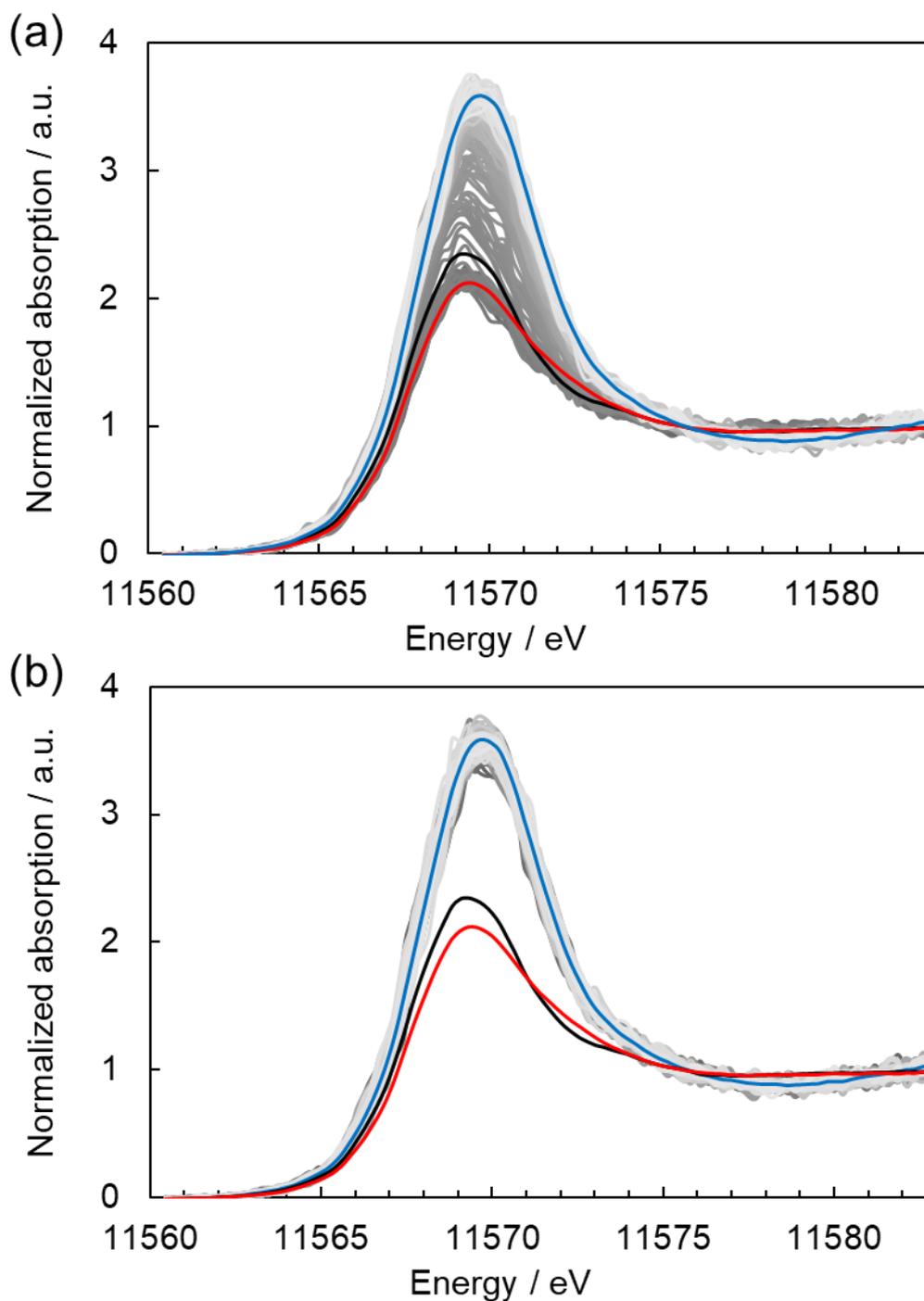


Figure S4. Time resolved in situ Pt L₃-edge HERFD-XANES spectra taken at the CO oxidation process (★): (a) 0-14.9 s; (b) 15.0-29.9 s. The static spectra after the pretreatment (i, black), the CO adsorption (iv, red), and the CO oxidation (v, blue) used for the linear combination fitting analysis are also shown as references.

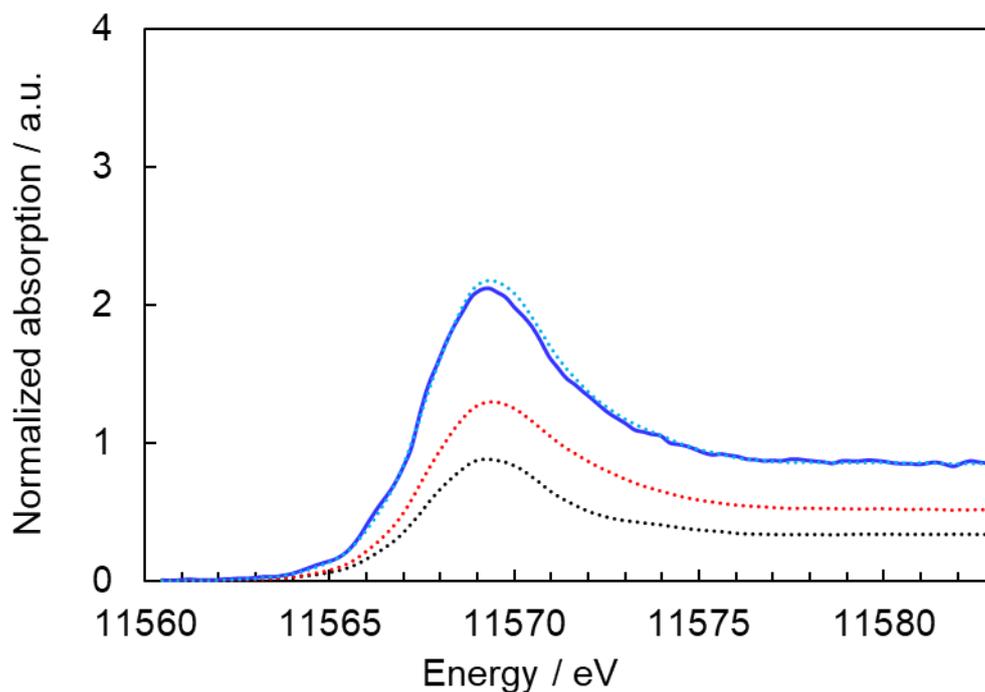


Figure S5. The spectrum obtained by integrating the 30 spectra before the O₂ injection (0-2.9 s in ★, blue solid) and the fitted spectrum (light blue dotted) from the linear combination fitting using the static spectra after the pretreatment (i, black dotted) and CO adsorption (iv, red dotted). The compositions of the static spectra after the pretreatment (i, black dotted) and CO adsorption (iv, red dotted) were 61% and 39%, respectively.

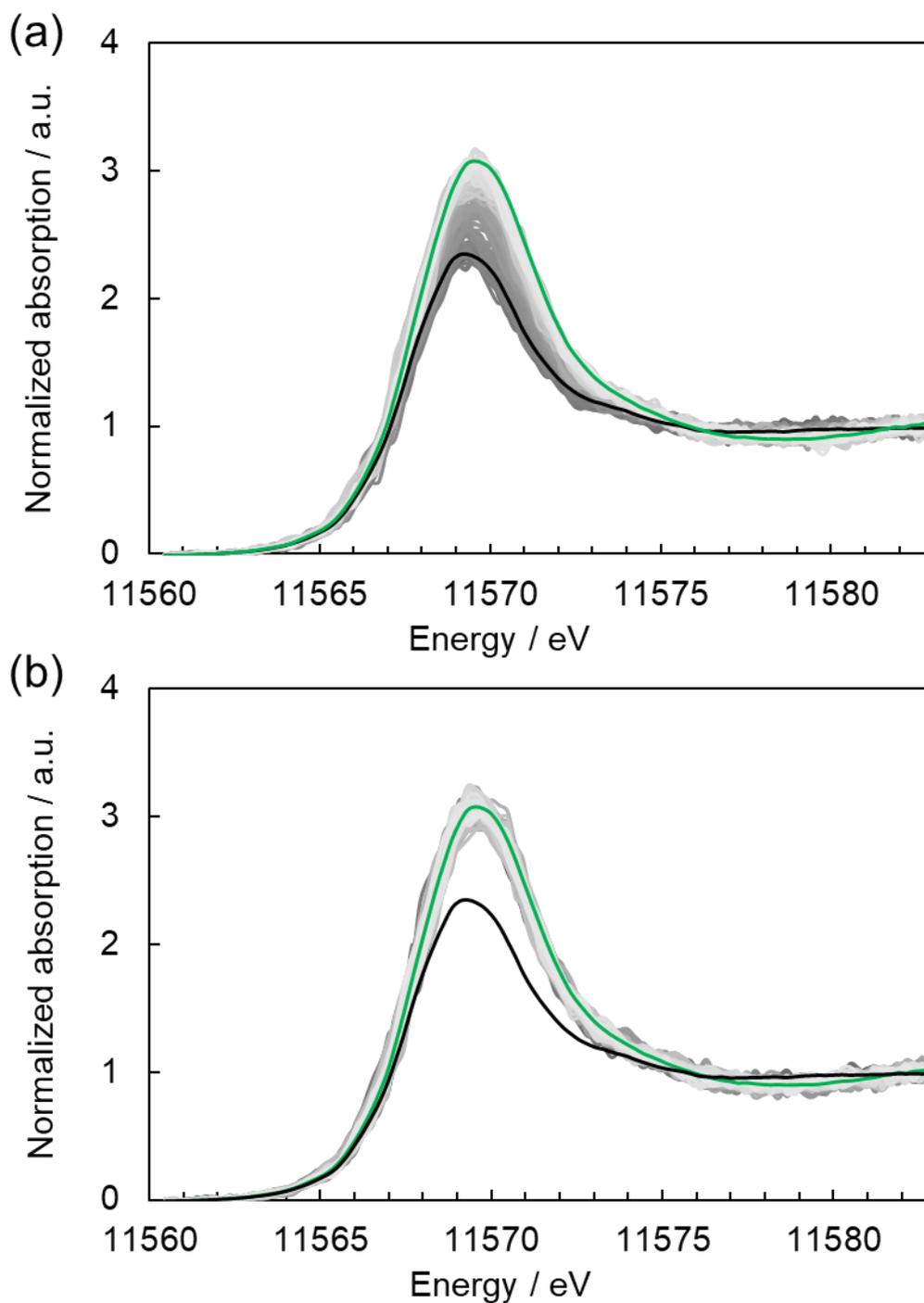


Figure S6. Time resolved in situ Pt L₃-edge HERFD-XANES spectra taken at the simple oxidation process (☆): (a) 0-14.9 s; (b) 15.0-29.9 s. The static spectra after the pretreatment (i, black) and the simple oxidation (ii, green) used for the linear combination fitting analysis are also shown as references.