Supporting information

The extended X-ray absorption fine structure (EXAFS) and X-ray absorption near edge structure (XANES) spectra analysis

EXAFS measurements at the Pt L_3-edge were carried out at BL5S1 of Aichi synchrotron radiation center (proposal number 201803007) with a Si(111) double-crystal monochromator in the transmittance mode at room temperature. Table S1 shows the curve-fitting results of Pt L_3 –edge EXAFS for Pt-PVP, PtO_2 and Pt foil.

Table S1. Curve-fitting results of Pt L_3 –edge EXAFS for Pt-PVP, PtO_2 and Pt foil.

Sample	Shell	CN	R (Å)	σ (Å)
Pt foils	Pt-Pt	12.0	2.77	0.070
Pt-PVP	Pt-Pt	4.0	2.76	0.071
	Pt-C(O)	1.3	1.99	0.073
PtO_2	Pt-O	6.0	2.00	0.070

CN: Coordination number, R: interatomic distance, σ: Debye Waller factor

In order to obtain information such as the electronic state of Pt and its peripheral structure, EXAFS spectrum of Pt-PVP was measured, and then compared with those of PtO_2 and Pt foil as a reference to bulk phase of metallic Pt. Since Pt-PVP had a peak at the same position observed in Pt-foil, it was assumed that it retained its metallicity well. Here, the fact that the peak of Pt-PVP was generally smaller than that of Pt-foil is due to the small particle size.

Transmission Electron Microscope (TEM) measurements

For TEM measurements, a drop of the solutions samples was mounted on carbon covered copper mesh. TEM images of Pt nanoparticles were recorded with a JEM-2100F (JEOL) electron microscope operated at 200 kV.

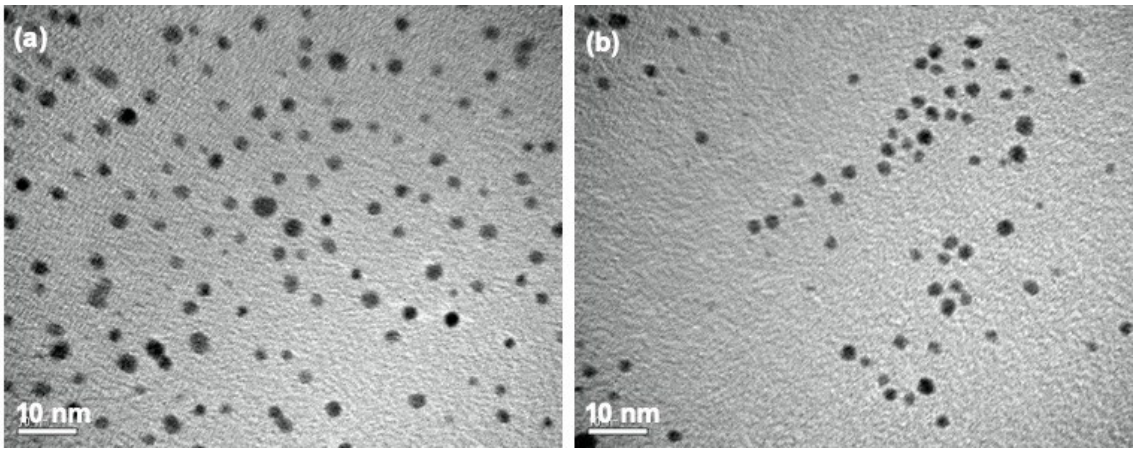

Figure S1. TEM image of Pt-PVP before (a) and after formic acid decomposition at 60 ^{o}C, 24 h(b).

TEM images of the catalyst after formic acid decomposition at 60.0 ^{o}C were measured to evaluate the agglutination of the catalyst as shown in Figure S1. The average particle size of the catalyst after reaction did not change compared with that of the catalyst before reaction (a). Therefore, no agglutination of Pt nanoparticles in the catalyst was observed.