

Supporting information:

The influence of chloride impurities on Pt/C fuel cell catalyst corrosion

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Experiments were carried out in a BASi electrochemical flow cell (Cross-Flow Cell Kit MW-5052) with homemade silicon gasket of 1 mm thickness (which is approximately 20 times thicker than the one used in our previous paper¹) coupled with an Agilent 7500ce ICP-MS instrument (Agilent Technologies, Palo Alto, USA) equipped with a MicroMist glass concentric nebulizer and a Peltier-cooled Scott-type double-pass quartz spray chamber. A forward radio frequency power of 1500 W was used with the following Ar gas flows: carrier 0.85 Lmin⁻¹, makeup 0.28 Lmin⁻¹, plasma 1 Lmin⁻¹, and cooling 15 Lmin⁻¹. Electrochemical experiments were performed in 0.1 molL⁻¹ HClO₄ (Aldrich 70%, 99.999% trace metals basis) acid with various concentrations of chloride (blank + 10⁻⁶ - 10⁻² molL⁻¹). Solutions were pumped at 263 μLmin⁻¹ using single syringe infusion pump (WPI sp100i) into the EFC which was directly connected to the nebulizer of the ICP-MS apparatus. EFC was additionally connected to ground at the peristaltic pump rollers to minimize spikes of ICP-MS response from static charging. To obtain the best possible signal-to-noise ratio fine tuning of ICP-MS was performed before the measurements took place. Two glassy carbon disks were equally coated with catalyst thin films by drop casting method, where 1 mg ml⁻¹ suspension of well-dispersed catalyst in Mili-Q (18.2 Ω) filtered (Millipore) water was used. Suspension was air dried and impregnated with freshly prepared 0.1% Nafion (1 mL) in 2-propanol. Total dry mass was 10 μg (5 μg per each electrode). Catalyst consists of 3 nm narrow dispersed Pt particles supported on carbon black (Vulcan XC72) with metal loading of 28.6%.

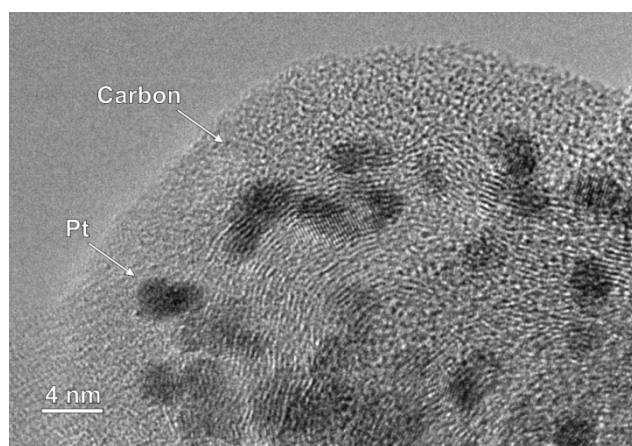


Figure 1: Representative TEM micrographs of the commercial carbon supported Pt nanoparticles used in this study.

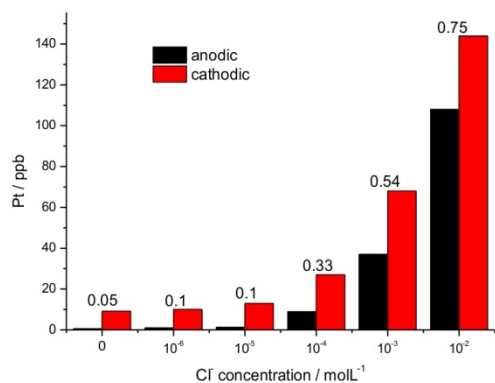


Figure S2: Peak platinum concentration (in ppb) during anodic and cathodic polarisation at different chloride concentrations. The numbers on top of columns represent the ratio between the anodic and cathodic Pt concentration at given concentration of chloride.

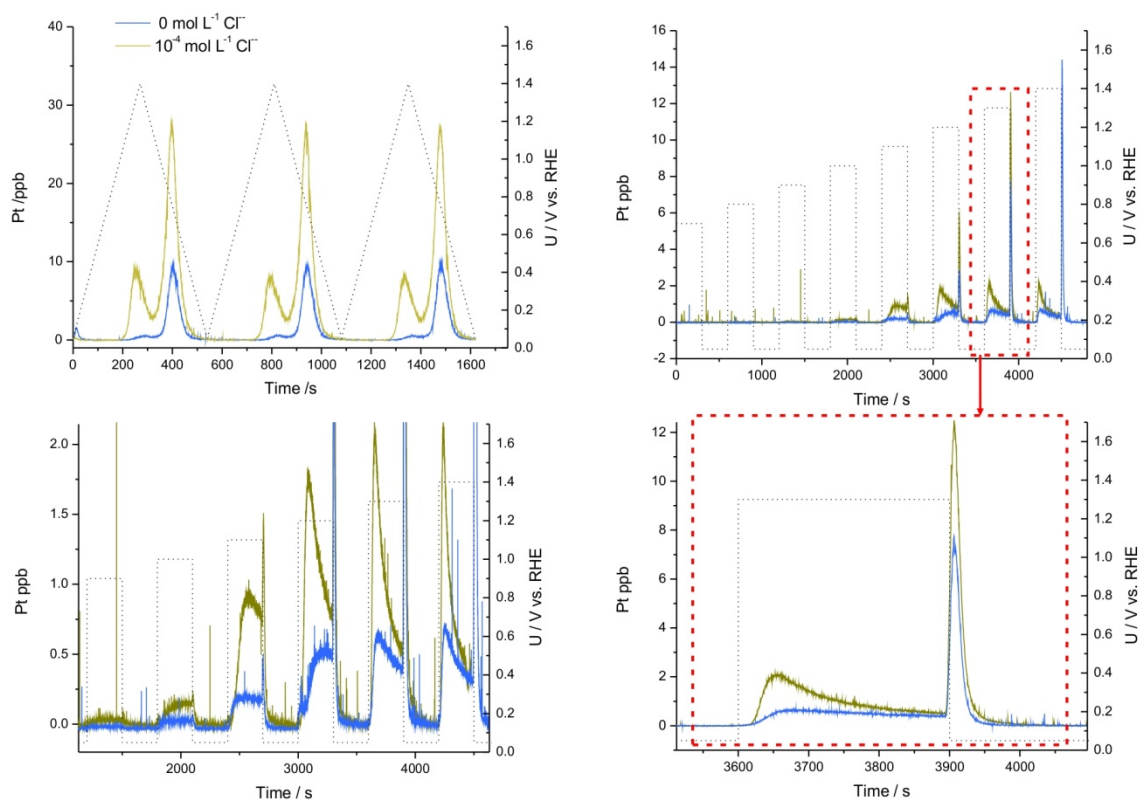


Figure S3: Time-resolved Pt ICP-MS response at a) potentiodynamic cycling between 0.05 V and 1.4 V vs. RHE with 5 mV/s in 0.1 M HClO₄ (for comparison) and b), c) and d) potentiostatic experiments jumping from 0 V to different cathodic potentials.

1. P. Jovanovič, A. Pavlišič, V. S. Šelih, M. Šala, N. Hodnik, M. Bele, S. Hočevar and M. Gaberšček, *ChemCatChem*, 2013, DOI: 10.1002/cctc.201300936, n/a-n/a.