## Supplementary Information

### Electrochemical Growth Mechanism of Nanoporous Platinum layers

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### Supplementary Table 1. Pore size and thicknesses of porous platinum layers

| t (s) | AD % g/g | Potential V vs RE | Pore size (nm) | R (kΩ) | Thickness (nm) | t (s) | AD % g/g | Potential V vs RE | Pore size (nm) | R (kΩ) | Thickness (nm) |
|-------|----------|------------------|---------------|---------|----------------|-------|----------|------------------|---------------|---------|----------------|
| 30    | 0.00     | -0.7             | 30±1          | 180±10  | 90              | 0.00  | -0.7     | 5±1              | 821±14        | 50±2    |
|       |          |                  |               |         |                |       |          |                  |               |         |
| 30    | 0.01     | -0.7             | 80±1          | 800±25  | 90              | 0.01  | -0.7     | 18±1             | 950±31        | 80±2    |
|       |          |                  |               |         |                |       |          |                  |               |         |
| 30    | 0.03     | -0.7             | 56±4           | 125±3   | 90              | 0.03  | -0.7     | 5±1              | 98±37         | 120±5   |
|       |          |                  |               |         |                |       |          |                  |               |         |
| 30    | 0.05     | -0.7             | 59±4           | 128±3   | 90              | 0.05  | -0.7     | 8±1              | 106±21        | 123±7   |
|       |          |                  |               |         |                |       |          |                  |               |         |
| 60    | 0.07     | -0.7             | 72±1           | 154±3   | 120             | 0.01  | -0.7     | 14±1             | 1409±640      | 250±35  |
|       |          |                  |               |         |                |       |          |                  |               |         |
| 90    | 0.01     | -0.7             | 80±2           | 124±2   | 150             | 0.01  | -0.7     | 17±1             | 1699±660      | 264±10  |
|       |          |                  |               |         |                |       |          |                  |               |         |

Aqueous electrolysis of 0.5% (g/g)PtCl₄ at 22°C

Pt⁴⁺ + 4e⁻ → Pt⁺;
Pt²⁺ + 2e⁻ → Pt⁺;
Pt⁺ + 2e⁻ → Pt⁰

Non-aqueous electrolysis of 0.5% (g/g)PtCl₄ at 22°C

Pt⁴⁺ + 4e⁻ → Pt⁺;
Pt²⁺ + 2e⁻ → Pt⁺;
Pt⁺ + 2e⁻ → Pt⁰

M → M⁺ + ze⁻; 4HO → O₂ + H₂O + 4e⁻; 2Cl⁻ → Cl₂ + 2e⁻

**Notes:**

- Points contact measurement.
- Thicknesses are taken from measurements performed within last 5 years.
- An unambiguous determination of the thickness of nanoporous layers is only possible for nanoporous layers with constant pore size. The error interval in the thickness increases with increasing differences in bottom porosity, residual porosity, and surface porosity of the nanoporous layer.