

Supplementary

Table A1. The basic properties of the anion exchange membrane (AHA, Astom. Japan).

Type	Strongly basic anion permeable
Characteristics	High mechanical strength, base resistant (Cl-form)
Electric resistance	$4.1 \Omega\text{-cm}^2$, 25 °C
Burst strength	$\geq 0.90 \text{ MPa}$
Thickness	0.22 mm

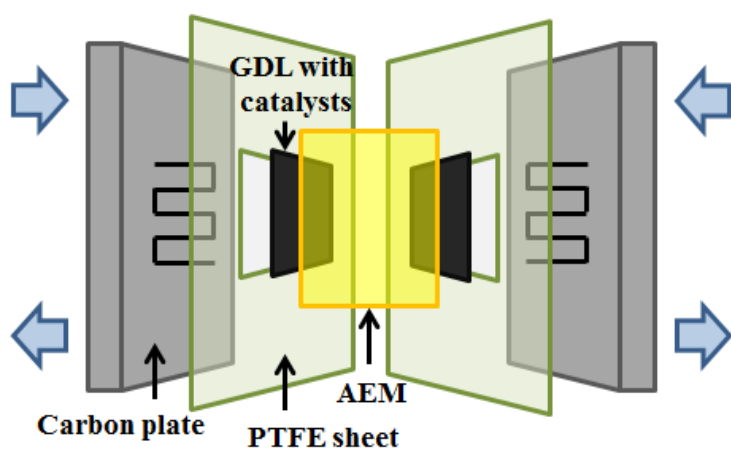


Fig. A1 Schematic diagram of the single cell

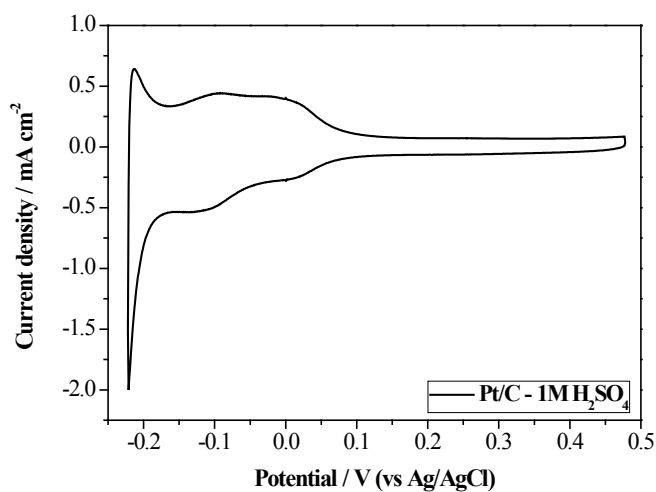


Fig. A2 Cyclic voltammogram of Pt/C in 1M H₂SO₄ solution at scan rate 15 mV sec⁻¹.

Calculation of electrochemical active surface area (EAS)

Proton adsorption/desorption area of Pt/C was achieved from potential range between -0.22 V ~ 0.1 V

(vs Ag/AgCl). To remove effect of capacitance, area corresponding to current density at 0.1 V was removed.
EAS of Pt/C is $17.2 \text{ m}^2 \text{ g}_{\text{catal.}}^{-1}$.

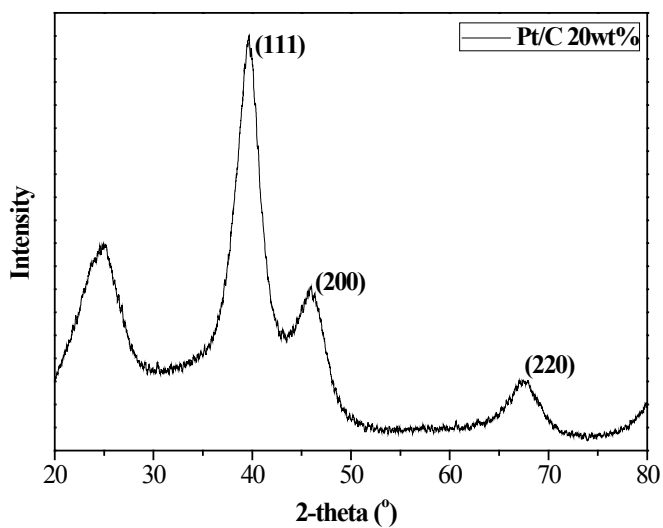


Fig. A3 XRD result of Pt/C

XRD pattern of Pt/C was characterized using $\text{CuK}\alpha$ radiation (XRD, D/MAX-IIIC diffractometer, Rigaku Co.).