The kinetically controlled current densities of the catalysts ($j_{k,Pt}$) estimated by the Koutecky - Levich plot (Fig. 11) can be used to evaluate the catalytic activity without the effect of the solution phase mass transport, as described in previous publications [Ref. 39 C. Coutanceau, M. J. Croissant, T. Napporn, C. Lamy, *Electrochim. Acta* 2000, **46**, 579-588.].

The Koutecky - Levich plot is based on equation s-1.

$$i^{-1} = i_L^{-1} + i_k^{-1} = (0.620\, n\mathrm{F}AcD^{2/3}\nu^{-1/6}\omega^{1/2})^{-1} + i_k^{-1} \qquad \text{(s-1)}$$

i_k	kinetically controlled current
i_L	diffusion-limited current defined by above relation
I	measured current
n	electron number of ORR
F	Faraday's constant (96487 C mol^{-1})
A	geometric surface area of electrode (cm^2)
c	concentration of O_2 (mol cm^{-3})
D	diffusion coefficient of O_2 (cm^2 s^{-1})
v	kinematic viscosity of the electrolyte solution (cm^2 s^{-1})
ω	rotation rate of the disk electrode (rad s^{-1})

We also evaluated the catalytic activity by use of equation (s-2) without a Koutecky - Levich plot. This method directly removes the effect of the diffusion-limited current that is actually measured and yields a limiting current-corrected Tafel plot. This method takes into consideration not only the diffusion of oxygen in solution but also any mass transport effects on the surface of the rotating electrode.

$$i_k = i \times i_L / (i_L - i) \qquad \text{(s-2)}$$

i_k	the kinetically controlled current
i_L	measured diffusion-limited current
i	measured current

We show a comparison of these two methods in Fig. S1 as a representative result of our sample (sample C). The kinetically controlled currents obtained by both methods showed good correspondence. Moreover, we also showed a similar comparison for the case of the commercial

catalyst Pt/CB (TEC10E50E, from Ref. 40) in Fig. S2. The kinetically controlled currents i_k evaluated with equations s-1 and s-2 are quite comparable, so we adopted the Koutecky - Levich plot to evaluate the kinetically controlled current in this work.

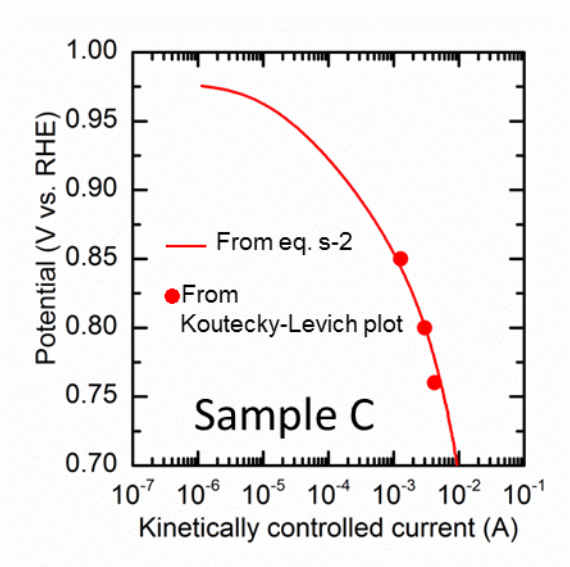

Fig. S1. Comparison between the Tafel plots for the kinetically controlled currents obtained by use of Koutecky - Levich plots (dots) and those obtained by use of equation s-2 (solid line, 1750 rpm) for the case of our sample C.

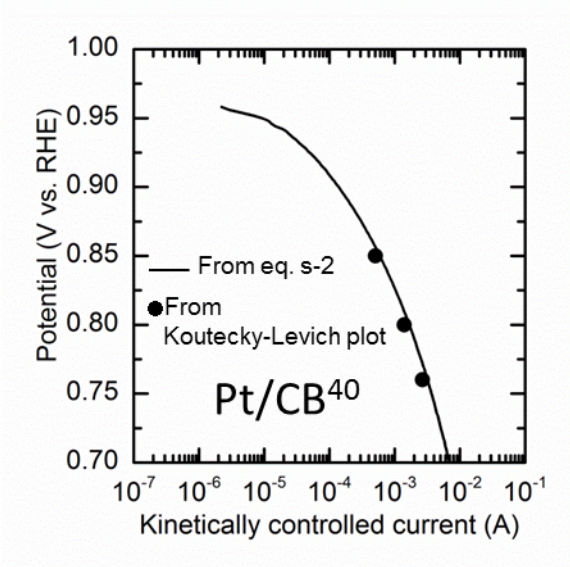

Fig. S2 Comparison between the kinetically controlled current obtained by use of Koutecky - Levich plot (dot) and that of obtained by use of equation s-2 (solid line, 1750rpm) in case of ref. 40.