Supporting information

In-situ growth of metallic Ag^0 intercalated CoAl layered double hydroxides as an efficient electrocatalyst for oxygen reduction reaction in alkaline solution

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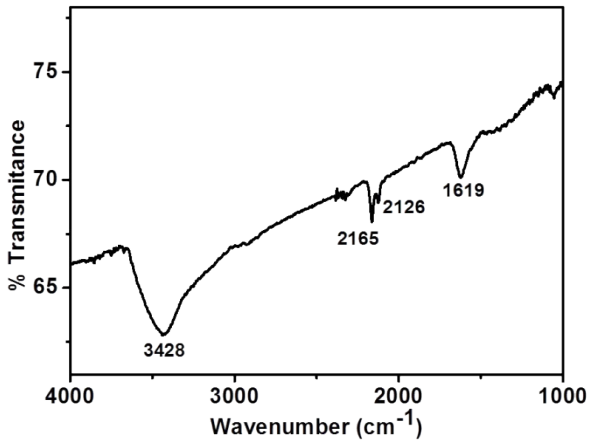

Fig. S1 FT-IR spectrum of CoAl-Ag-TEOA-180.

The peaks at 3428 and 1619 cm^{-1} were assigned to the stretching vibration modes of O-H and H-O-H,[1] respectively. The peaks of 2165 and 2126 cm^{-1} were the vibration mode of the cyanide triple-bond, confirming the presence of CN^- anions. However, the peaks were a little different from the free CN^- band at 2080 cm^{-1},[2] which could be ascribed to the influence of metal ions in the host layer [1,2].

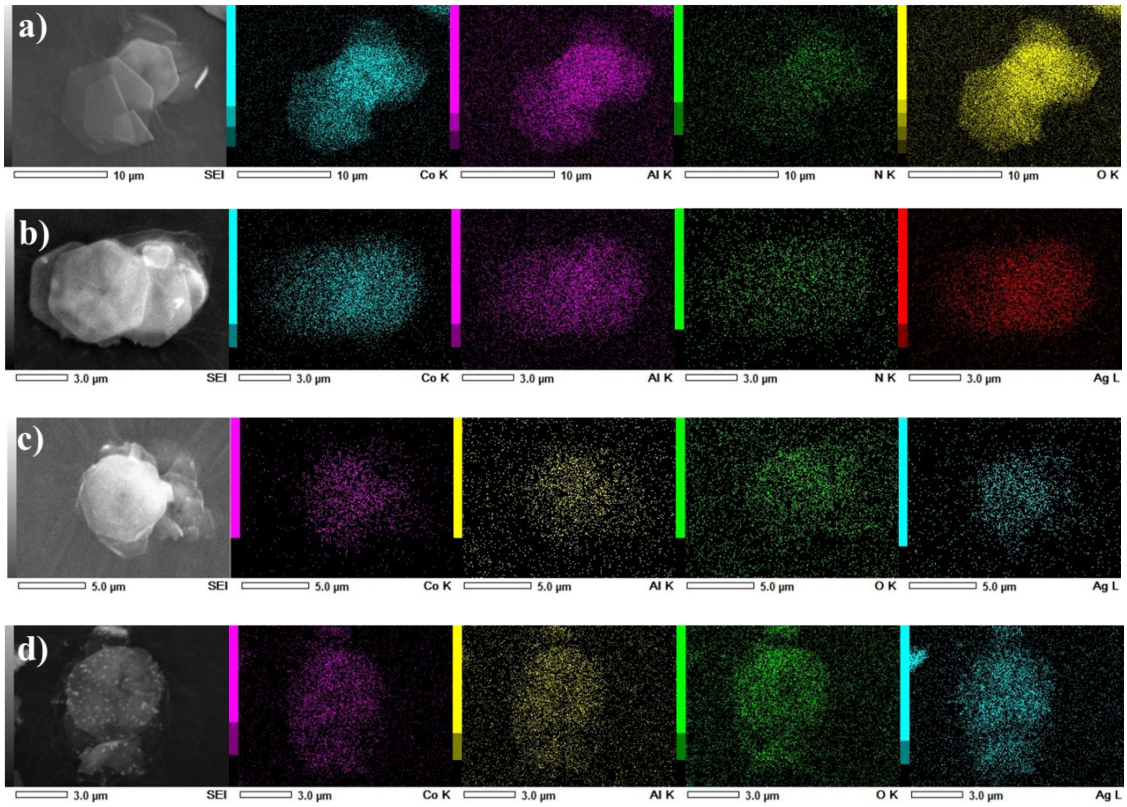

Fig. S2 Typically complete elemental mapping images of (a) CoAl-NO_3, (b) CoAl-$Ag(CN)_2$, (c) CoAl-Ag-30, and (d) CoAl-Ag-TEOA-180.

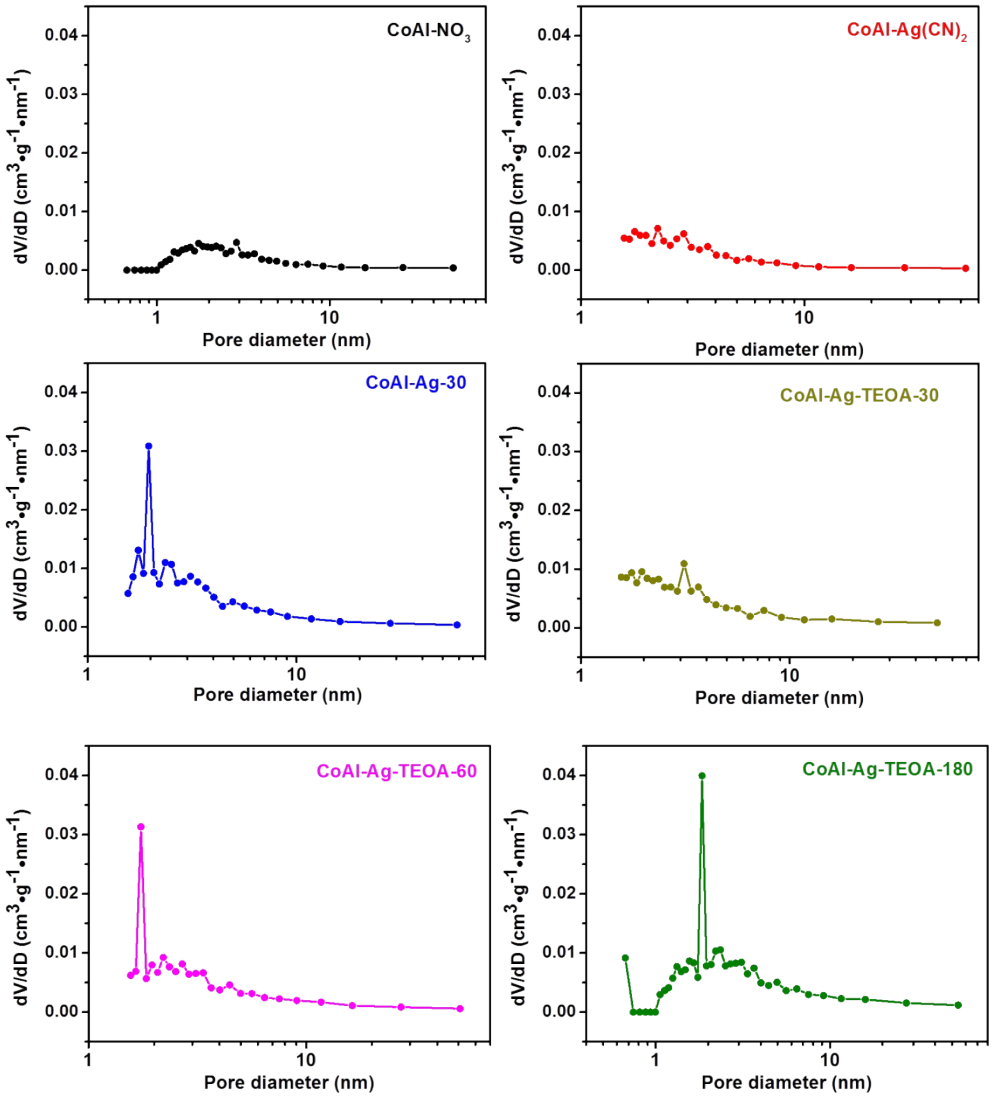

Fig. S3 Pore size distribution of as-prepared samples.

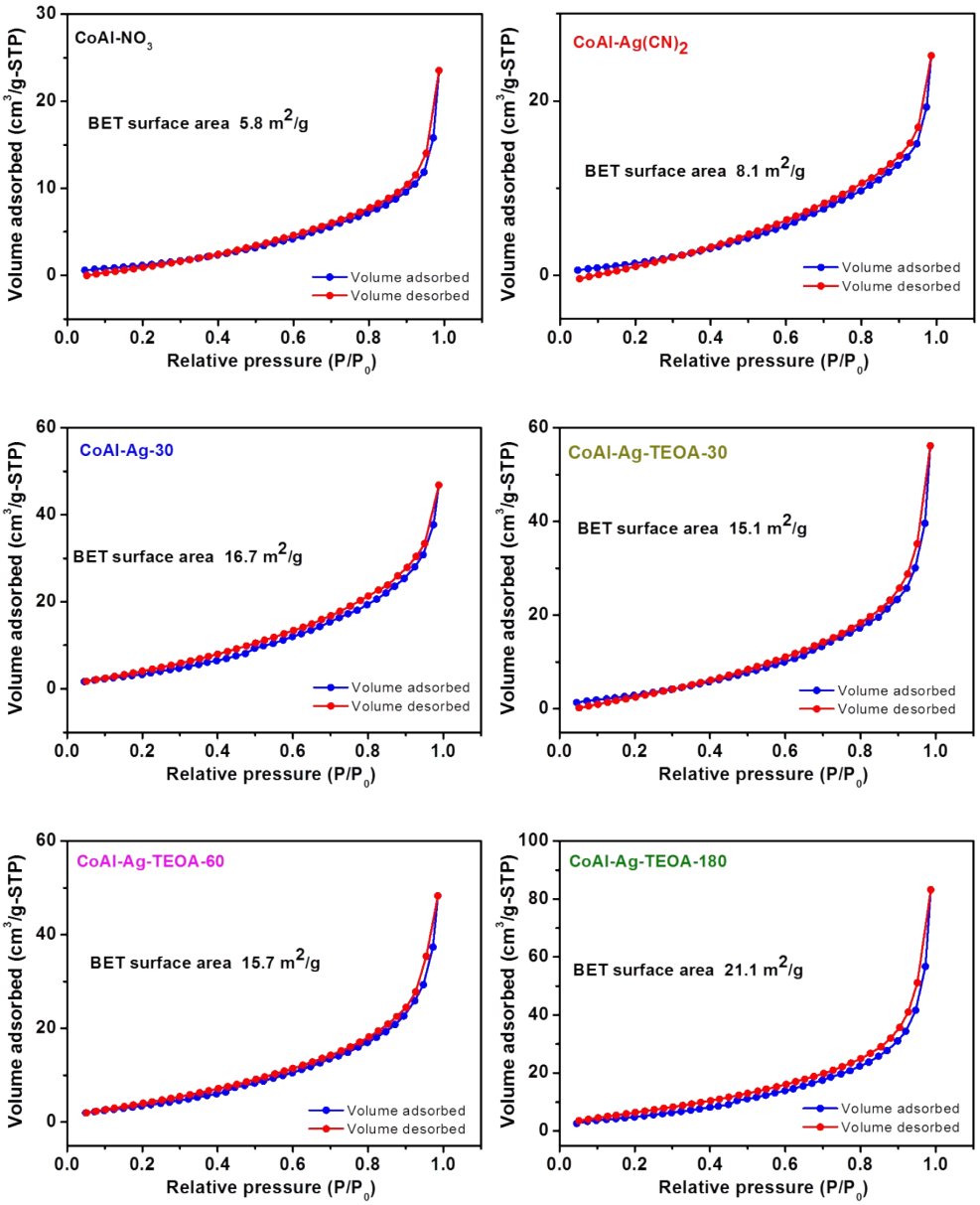

Fig. S4 N_2 adsorption-desorption isotherms of as-synthesized samples at 77K.

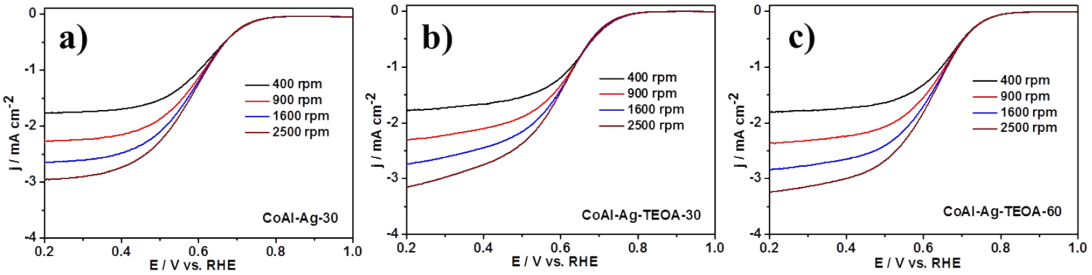

Fig. S5 ORR polarization curves of (a) CoAl-Ag-30, (b) CoAl-Ag-TEOA-30, and (c) CoAl-Ag-TEOA-60 catalysts in O_2-saturated 0.1 M KOH with a scan rate of 10 mV s^{-1} at different rotating rate: 400, 900, 1600, and 2500 rpm.

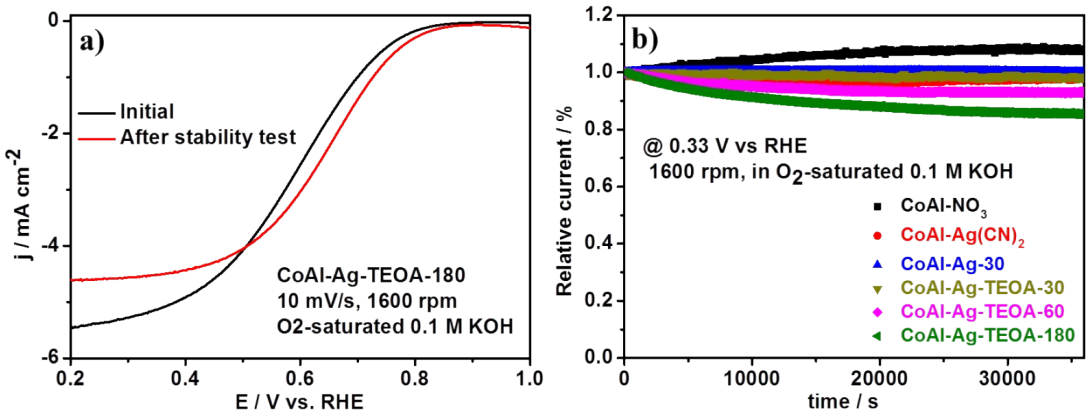

Fig. S6 (a) LSV curves of CoAl-Ag-TEOA-180 catalyst before and after 36000 s test with the rotating rate of 1600 rpm in O_2-saturated 0.1 M KOH. (b) Chronoamperometric stability curves of as-prepared catalysts with the rotating rate of 1600 rpm in O_2-saturated 0.1 M KOH by applying the potential of 0. 33 V (*vs.* RHE).

The ORR polarization curves of CoAl-Ag-TEOA-180 catalyst after 36000 s in Fig. S4a illustrated that the catalytic current density retained 85% of the initial performance, indicating the relatively good stability. Moreover, chronoamperometric measurement of all the samples exhibited the good durability after a testing period of 36000 s as plotted in Fig. S4b.

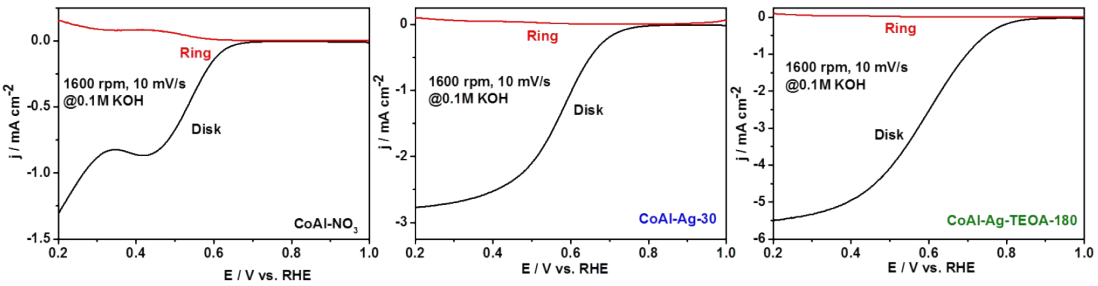

Fig. S7 Typical RRDE curves of as-synthesized samples ($CoAl\text{-}NO_3$, CoAl-Ag-30, and CoAl-Ag-TEOA-180) in O_2-saturated 0.1 M KOH with a scan rate of 10 mV s^{-1} at a rotation rate of 1600 rpm with the ring electrode biased at 1.4 V.

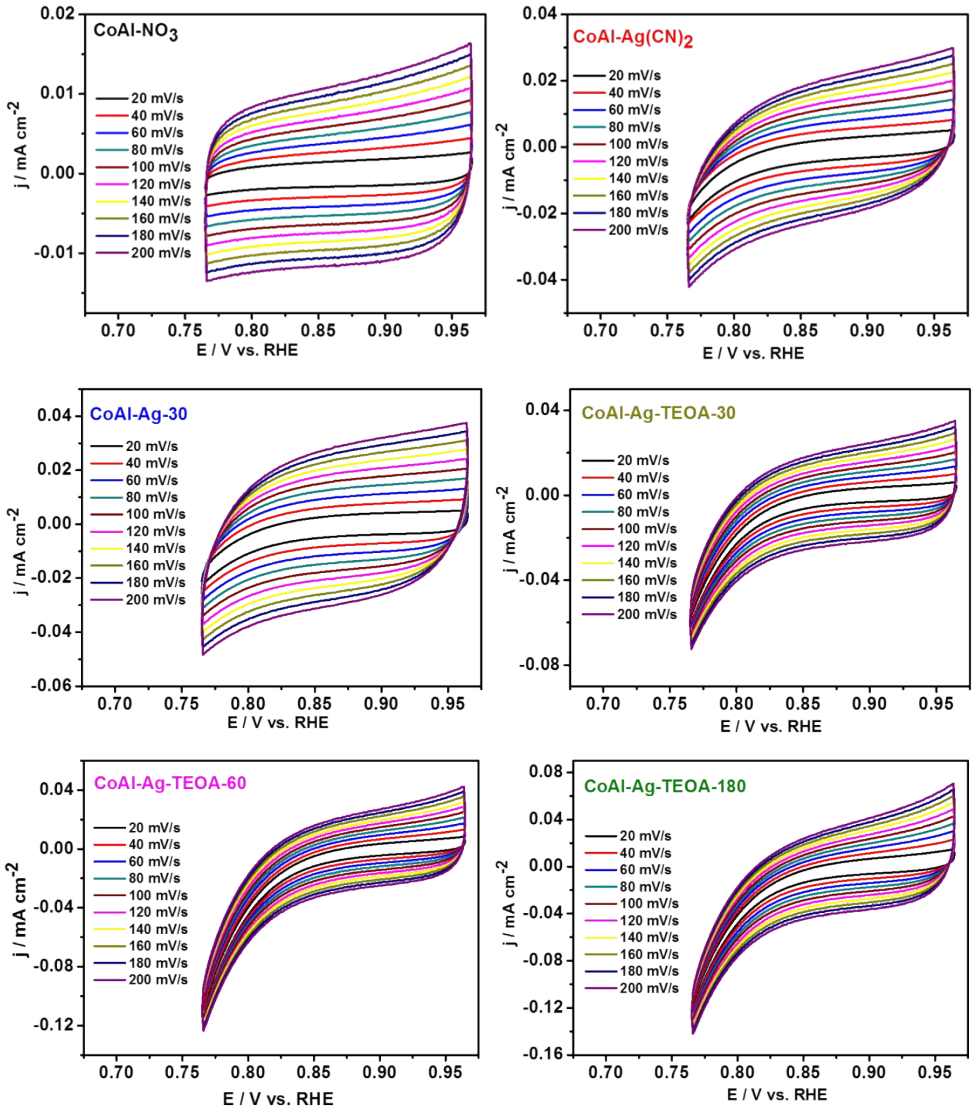

Fig. S8 CVs recorded with the bias range of 0.765-0.965 V (*vs.* RHE) in O_2-saturated 0.1 M KOH by the scan rates of 20, 40, 60, 80, 100, 120, 140, 160, 180 and 200 mV s^{-1} for the as-prepared catalysts, respectively, which was used to evaluate the electrochemical surface area (ECSA).

References

1 E. Coronado, C. Martí-Gastaldo, E. Navarro-Moratalla and A. Ribera, *Inorg. Chem.*, 2010, **49**, 1313–1315.

2 Y. Xu, J. Zhang, Y.Liang, J. Zhou, J. Zhao, X. Ruan, Z. Xu and G. Qian, *Sep. Purif. Technol.*, 2015, **145**, 92–97.