Supporting information for

Electrochemical Deposition of Amorphous Cobalt Oxides for Oxygen Evolution Catalysis

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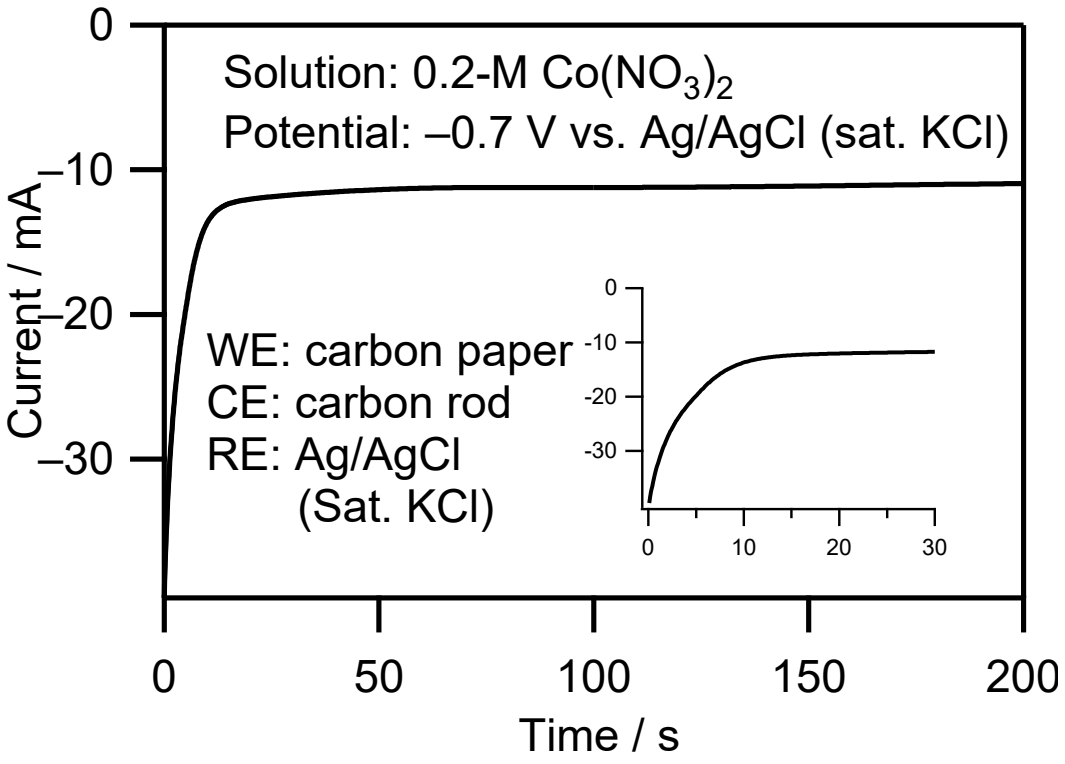

Figure S1 Chronoamperogram during the electrodeposition of Co_3O_4 on the CP in a 0.2-M $Co(NO_3)_2$ aqueous solution at −0.7 V vs. Ag/AgCl (saturated KCl).

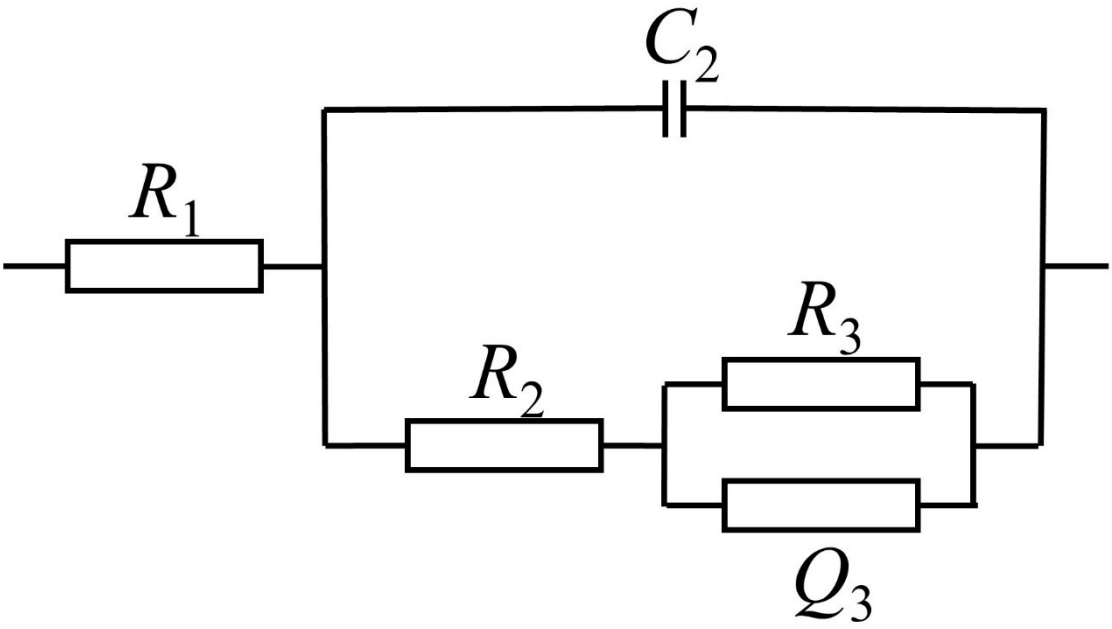

Figure S2 Equivalent circuit used in curve fittings of EIS spectra displayed in Fig. 3b and Fig. 5c.

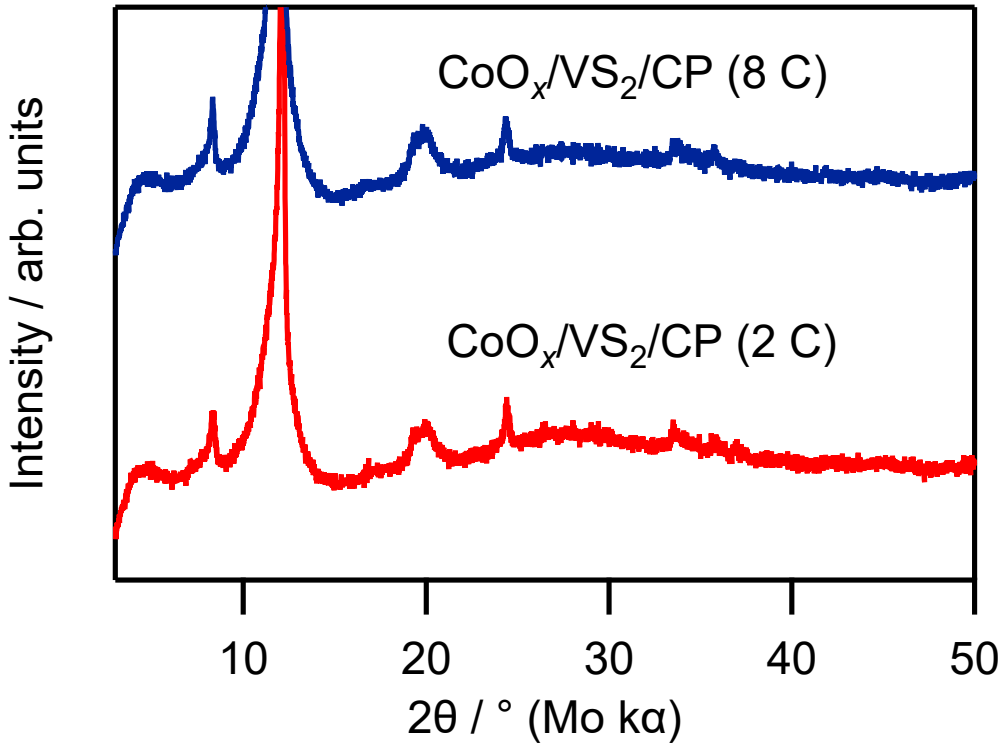

Figure S3 XRD patterns of CoO_x/VS_2/CP (2 C) and CoO_x/VS_2/CP (8 C) acquired with a Mo target (0.7107 Å).

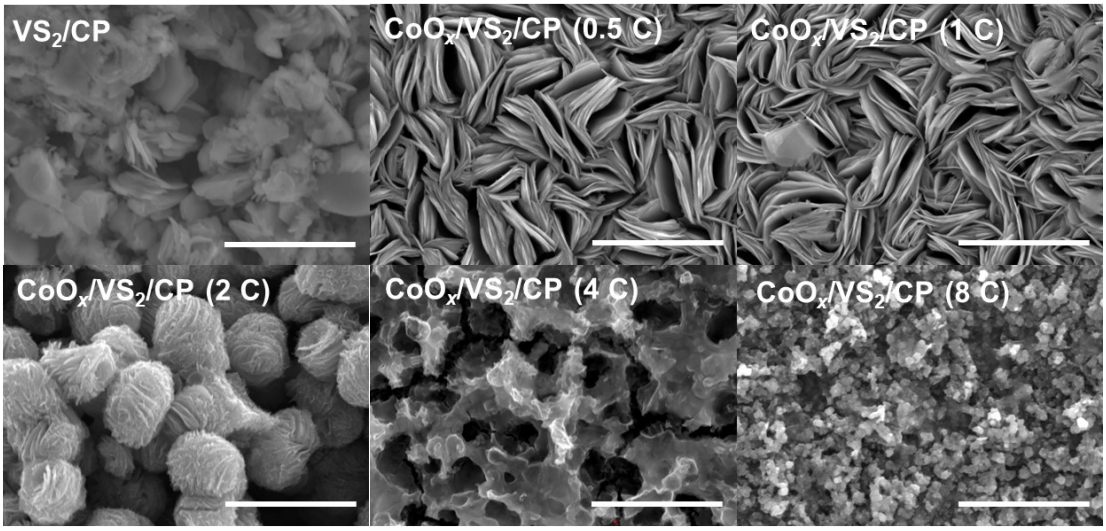

Figure S4 SEM images of VS_2/CP and CoO_x/VS_2/CP with different Co deposition amounts. The scale bar corresponds to 10 μm.

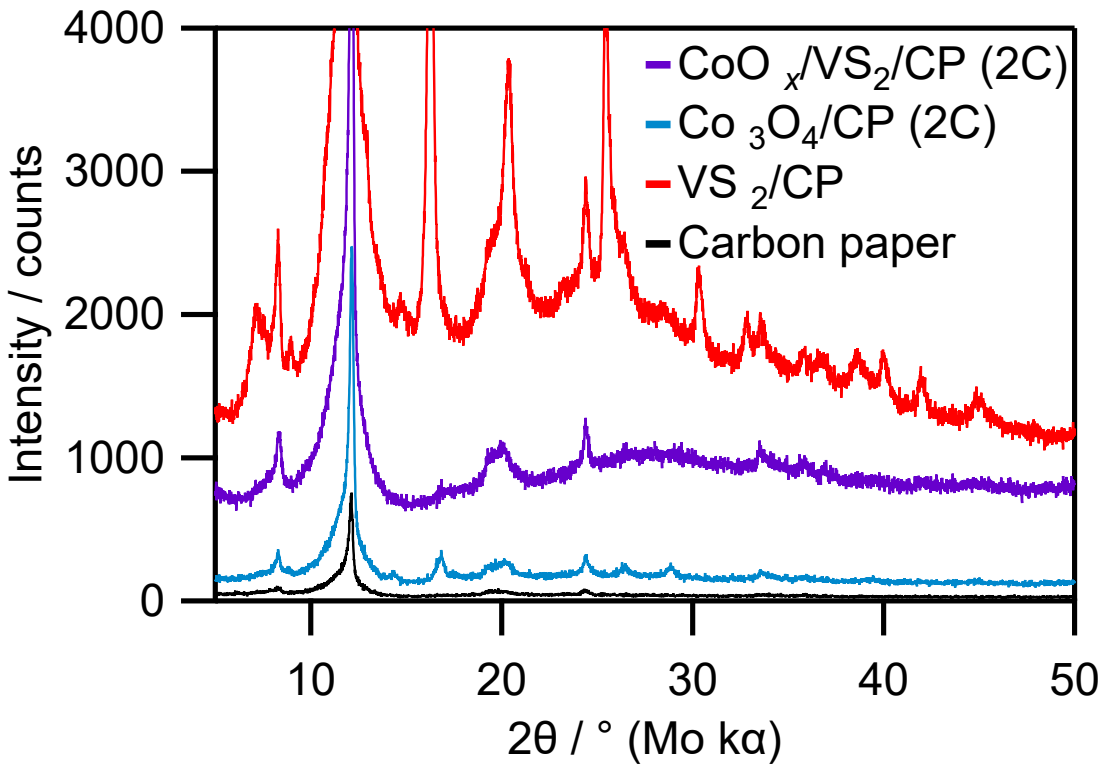

Figure S5 XRD patterns of the synthesized catalysts acquired with the Mo target (0.7107 Å).

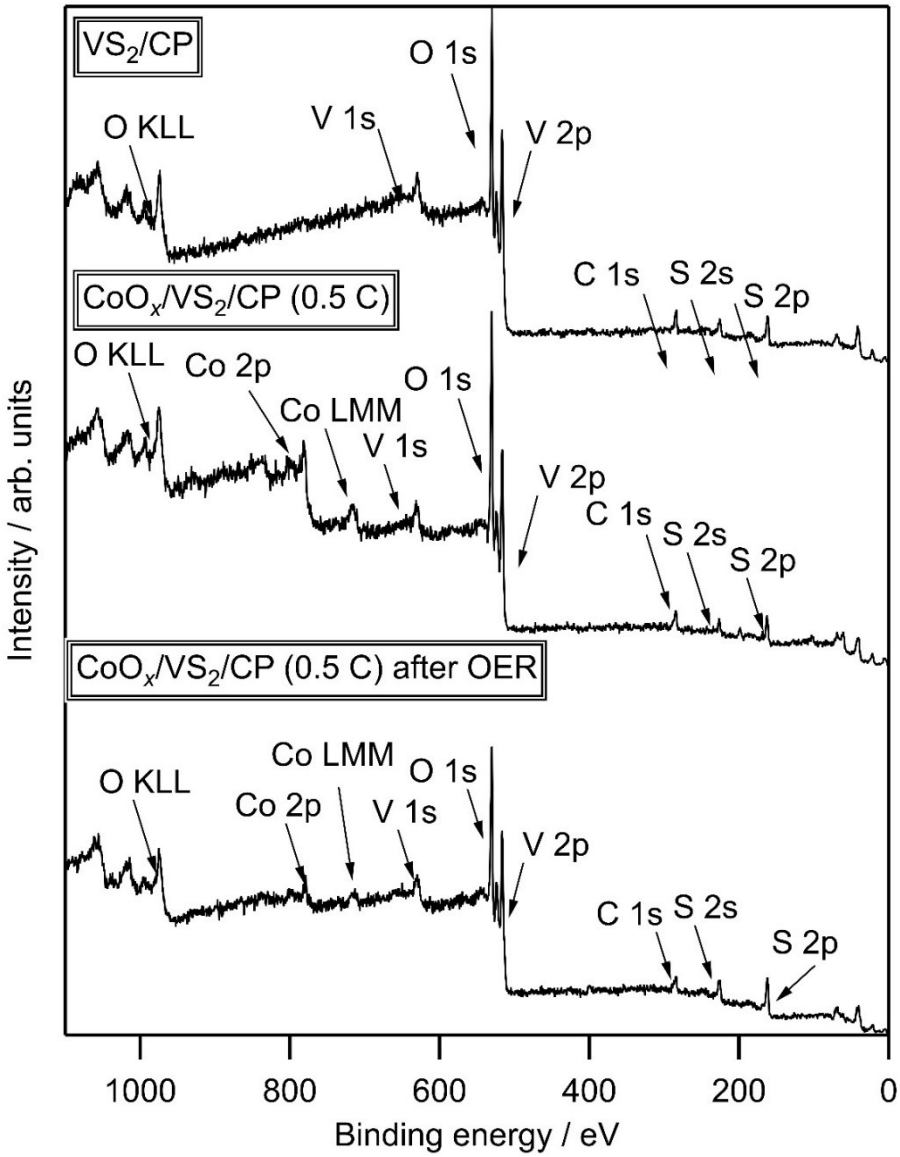

Figure S6 Full XP spectra of VS_2/C and CoO_x/VS_2/CP (0.5 C) before and after the cyclic voltammetry in the range of 1.23 to 1.83 V vs. RHE at a scan rate of 10 mV/s for 100 cycles.

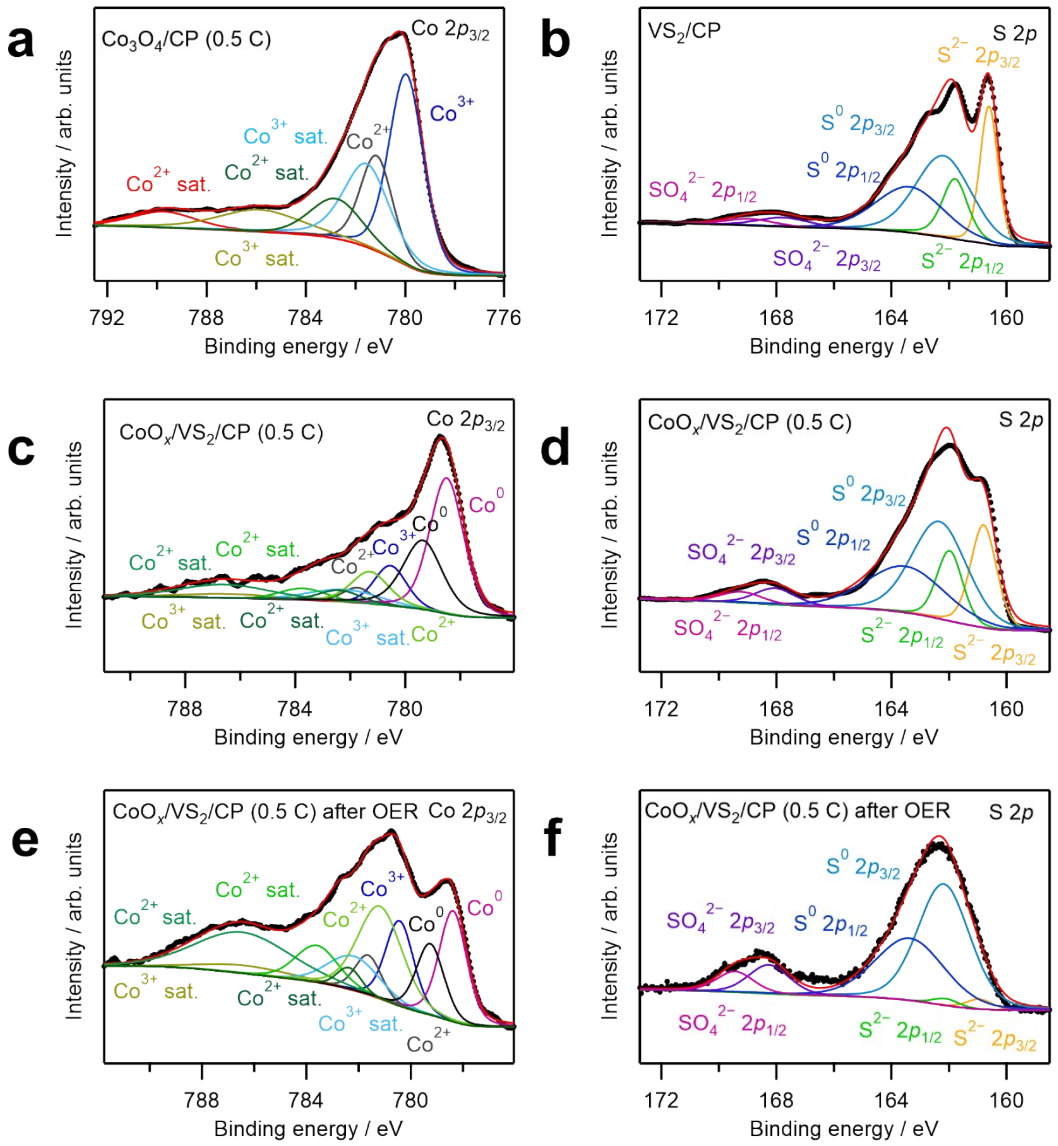

Figure S7 Deconvoluted XP spectra in the Co $2p_{3/2}$ and S $2p$ regions of Co_3O_4/CP (0.5 C), VS_2/CP, and CoO_x/VS_2/CP (0.5 C) before and after the cyclic voltammetry in the range of 1.23 to 1.83 V vs. RHE at a scan rate of 10 mV/s for 100 cycles[1,2].

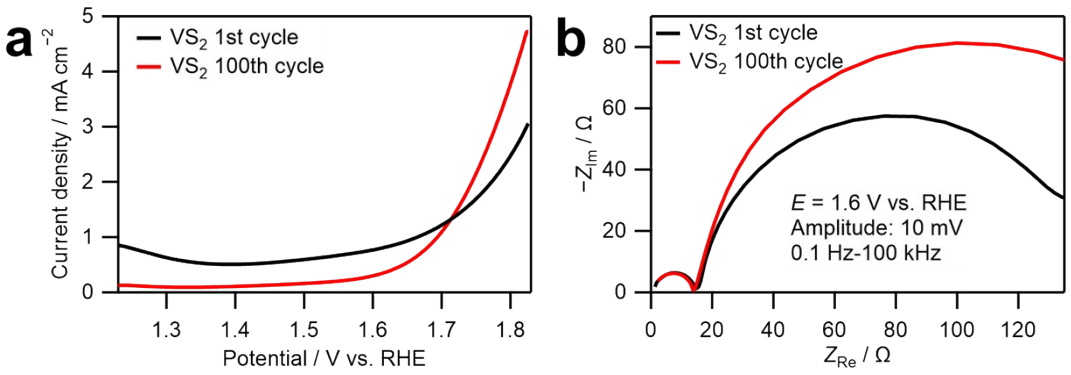

Figure S8 (a) Cyclic voltammograms and (b) Nyquist plots of EI spectra measured for VS_2 at the 1st cycle and 100th cycle.

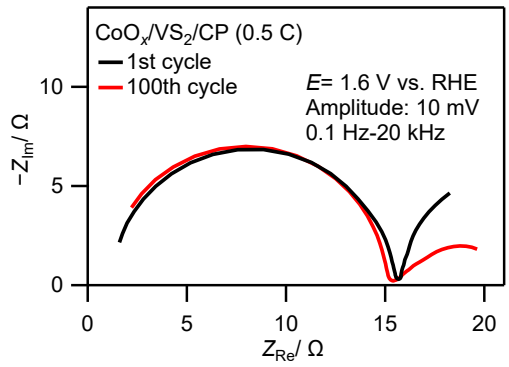

Figure S9 Nyquist plots of EI spectra measured for CoO_x/VS_2/CP (0.5 C) at the 1st cycle and 100th cycle.

Table S1 FWHMs of the 311 peaks at 16.8° for the deposited cobalt oxides Co_3O_4 on the CP synthesized at different parameters.

Sample	Temperature/°C	Electric quantity/C	Time/h	2ϑ/°	FWHM/°
Co_3O_4/CP	200	0.1	1	16.8	0.427
Co_3O_4/CP	200	0.1	3	16.888	0.273
Co_3O_4/CP	200	0.2	1	16.849	0.402
Co_3O_4/CP	200	0.2	3	16.919	0.225
Co_3O_4/CP	250	0.2	1	16.739	0.393
Co_3O_4/CP	300	0.2	1	16.830	0.385

Table S2 Curve fitting results of the Nyquist plots presented in Fig. 3b.

Sample	R_1/Ω	R_2/Ω	C_2/μF	R_3/Ω	Q_3/mF	α_3
Co_3O_4/CP (0.5 C)	1.582	14.62	0.3264	44.87	4.355	0.7651
Co_3O_4/CP (1 C)	1.633	15.97	0.3002	47.39	3.892	0.8246
Co_3O_4/CP (2 C)	1.333	13.33	0.3187	22	14.01	0.7018
Co_3O_4/CP (4 C)	1.364	14.64	0.313	34.64	9.078	0.7119
Co_3O_4/CP (8 C)	1.391	14.21	0.3029	17.35	43.05	0.5757

Table S3 Curve fitting results of the Nyquist plots presented in Fig. 5b.

Sample	R_1/Ω	R_2/Ω	C_2/μF	R_3/Ω	Q_3/mF	α_3
CP	1.059	11.93	0.4449	2114	0.1164	0.7963
VS_2/CP	1.122	13.6	0.3893	135.1	0.8755	0.8864
Co_3O_4/CP (0.5 C)	1.582	14.62	0.3264	44.87	4.355	0.7651
CoO_x/VS_2/CP (0.5 C)	1.296	14.16	0.3311	9.94	197.6	1

References

1. M.C. Biesinger, B.P. Payne, A.P. Grosvenor, L.W.M. Lau, A.R. Gerson, R. St.C. Smart, *Appl. Surf. Sci.*, 2011, **257**, 7, 2717–2730.
2. J. Yang, H. Liu, W.N. Martens, and R.L. Frost, *J. Phys. Chem. C*, 2010, **114**, 1, 111–119.