Supplementary Material for CrystEngComm

Comparative hydrothermal synthesis of CeO_2 crystals for use in light scattering layers of dye-sensitized solar cells

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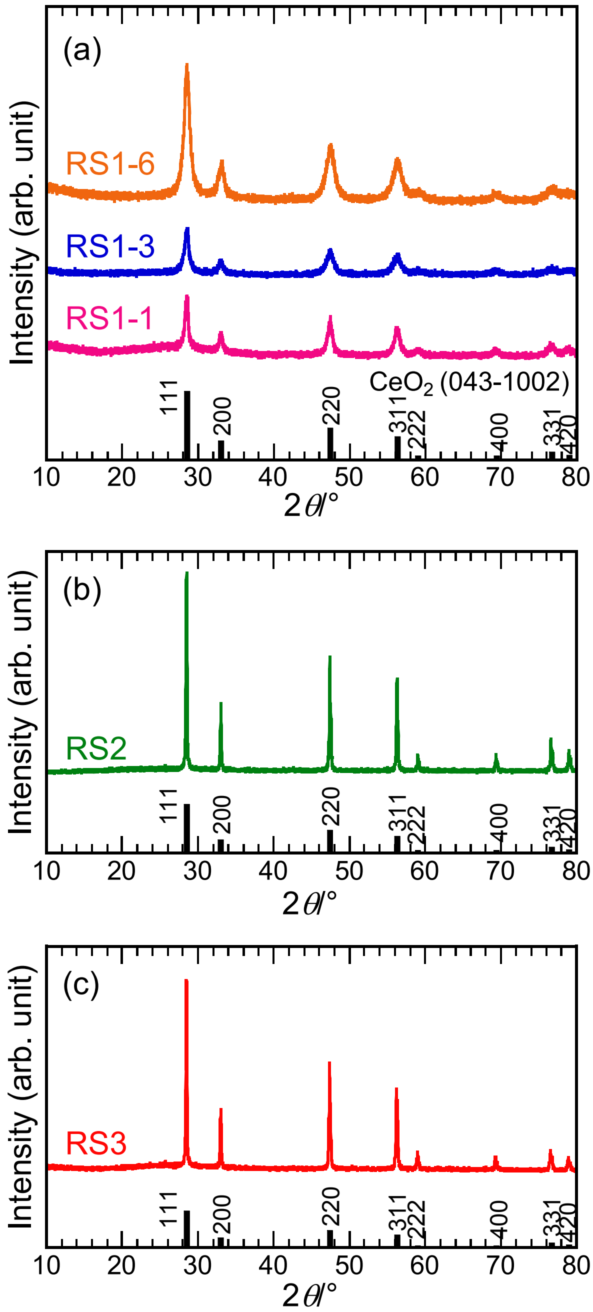

Fig. S1 XRD patterns of the CeO_2 particles obtained from (a) the RS1 (RS1-1, -3, and -6 corresponding to the Ce^{3+} concentrations), (b) the RS2, and (c) the RS3 solution through the hydrothermal reaction.

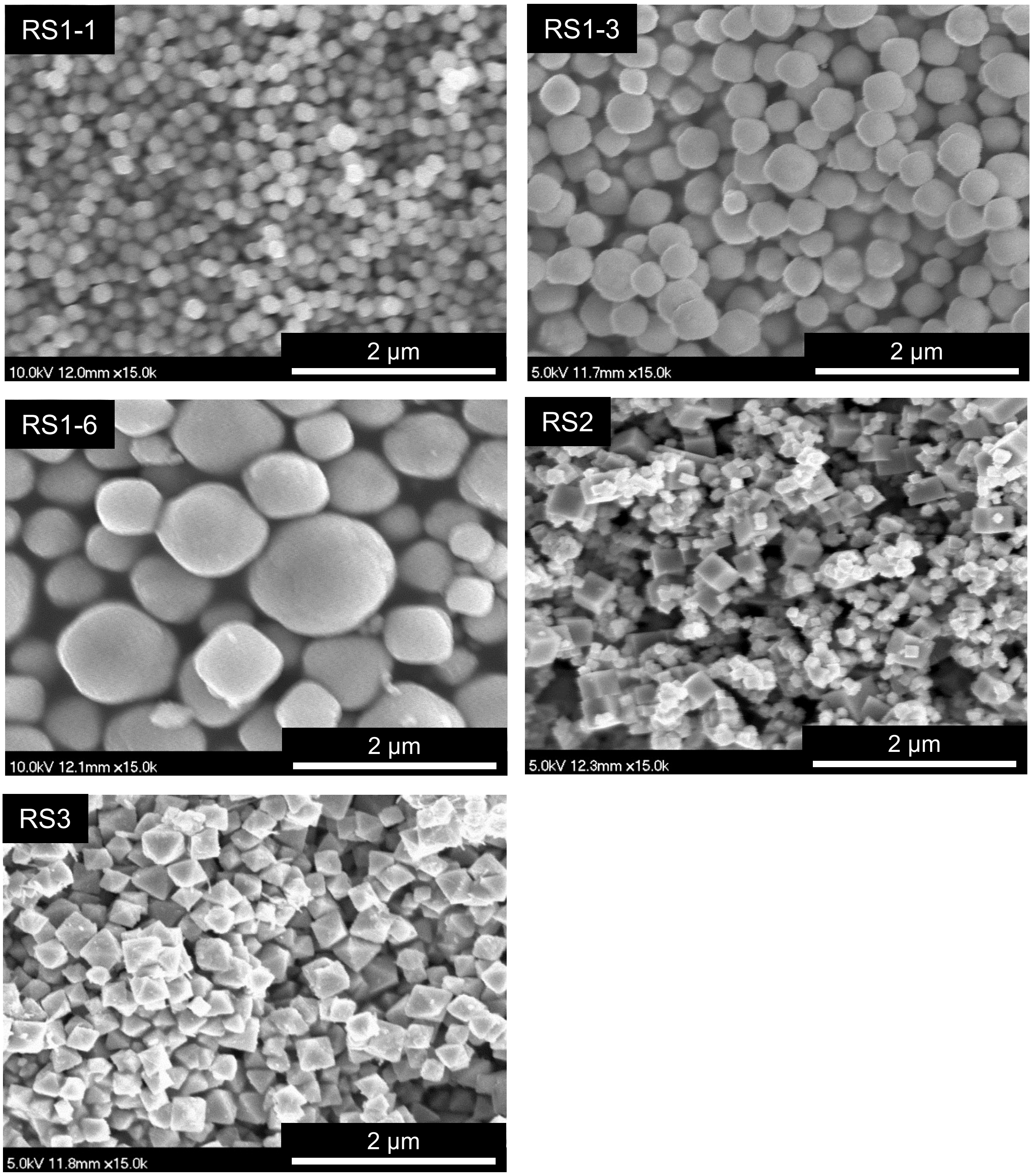

Fig. S2 Large-scale FESEM images of the CeO_2 particles obtained from the RS1 (RS1-1, -3, and -6 corresponding to the Ce^{3+} concentrations), the RS2, and the RS3 solution through the hydrothermal reaction.

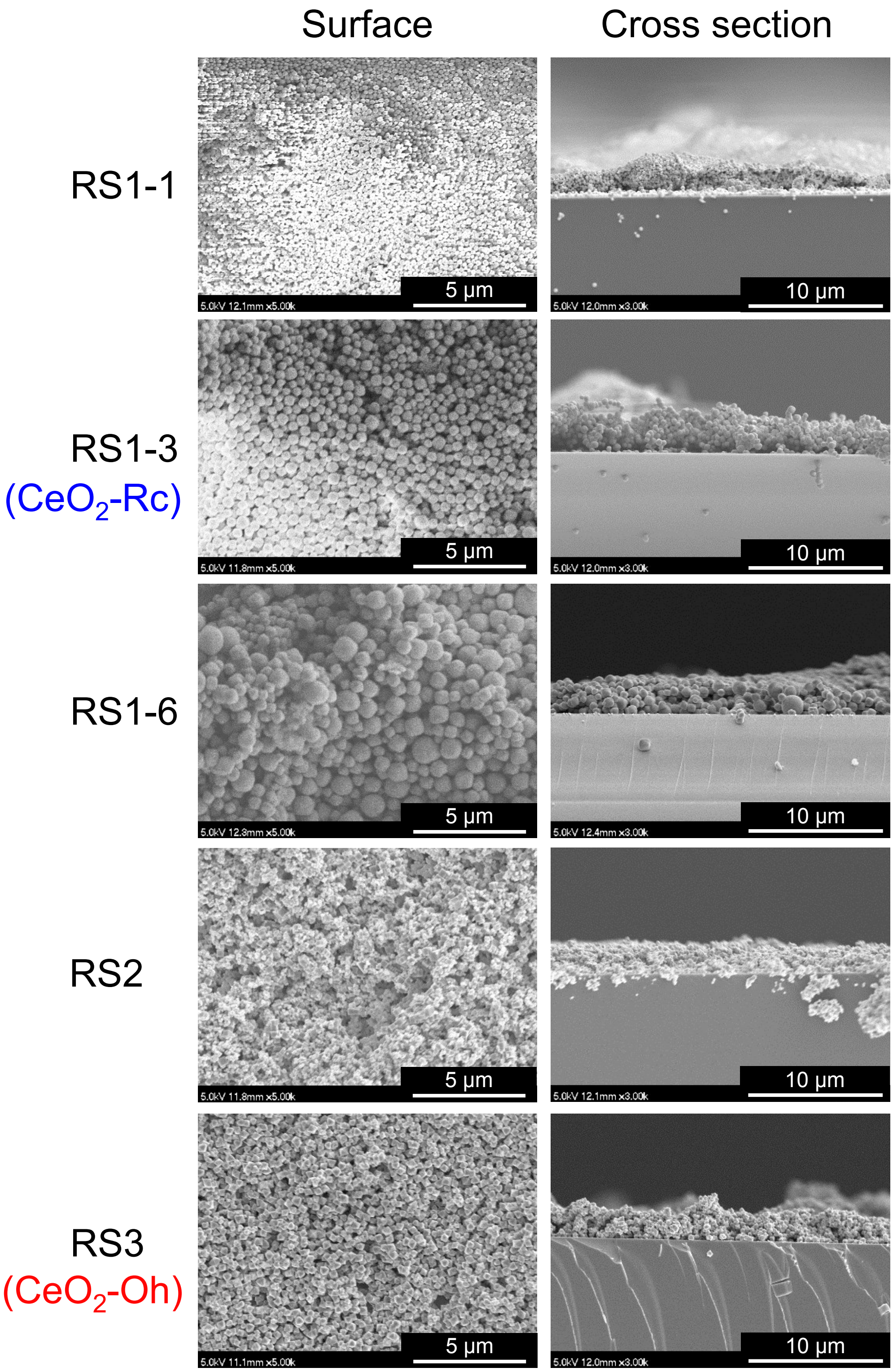

Fig. S3 Surface and cross-sectional FESEM images of the CeO_2 films fabricated using the CeO_2 particles obtained from the RS1 (RS1-1, -3, and -6 corresponding to the Ce^{3+} concentrations), the RS2, and the RS3 solution through the hydrothermal reaction.

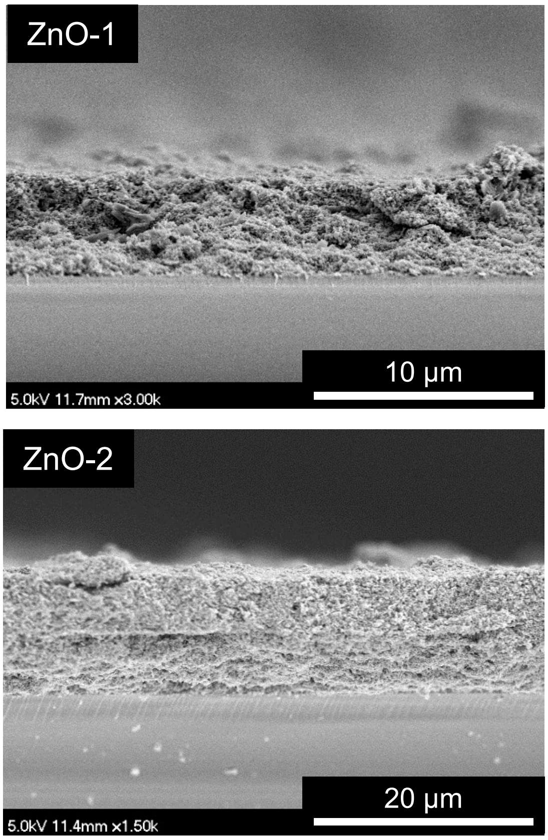

Fig. S4 Cross-sectional FESEM images of the ZnO-1 and the ZnO-2 film.

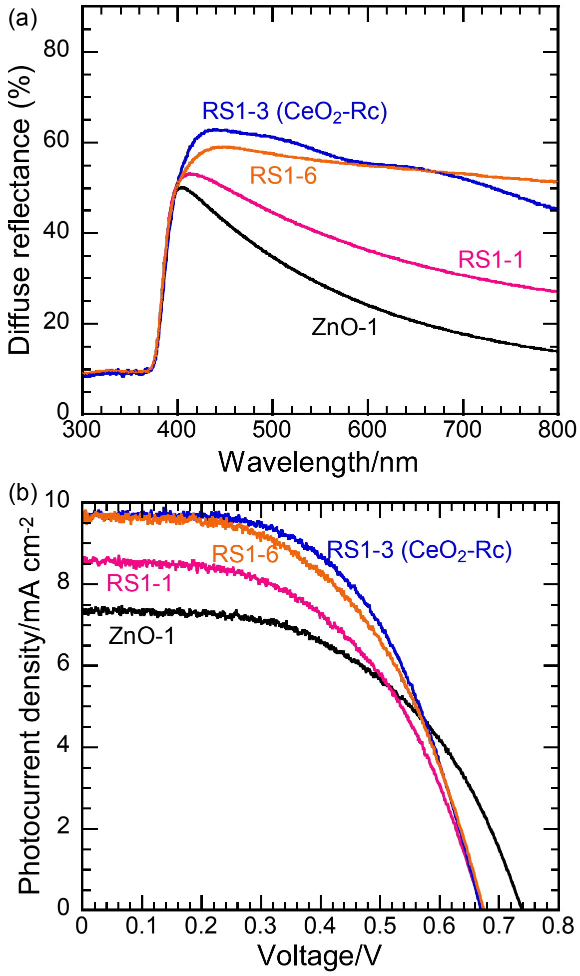

Fig. S5 (a) Diffuse reflectance spectra, measured from the substrate side, of the ZnO-1 films without or with the CeO_2 layers using the RS1-1, the RS1-3 (CeO_2-Rc), or the RS1-6 particles, and (b) *J*–*V* curves of the DSSCs using these films sensitized with N-719.

Table S1 Characteristics of DSSCs using the N719-sensitized ZnO and CeO_2/ZnO films.

Film	J_{sc}/mA cm^{-2}	V_{oc}/V	*ff* (-)	η (%)	Dye amount/10^{-8} mol cm^{-2}
ZnO-1	7.45	0.731	0.528	2.87	5.7
RS1-1/ZnO-1	8.27	0.673	0.526	2.92	8.8
RS1-3/ZnO-1	9.85	0.664	0.550	3.60	10.4
RS1-6/ZnO-1	9.78	0.668	0.508	3.32	8.1

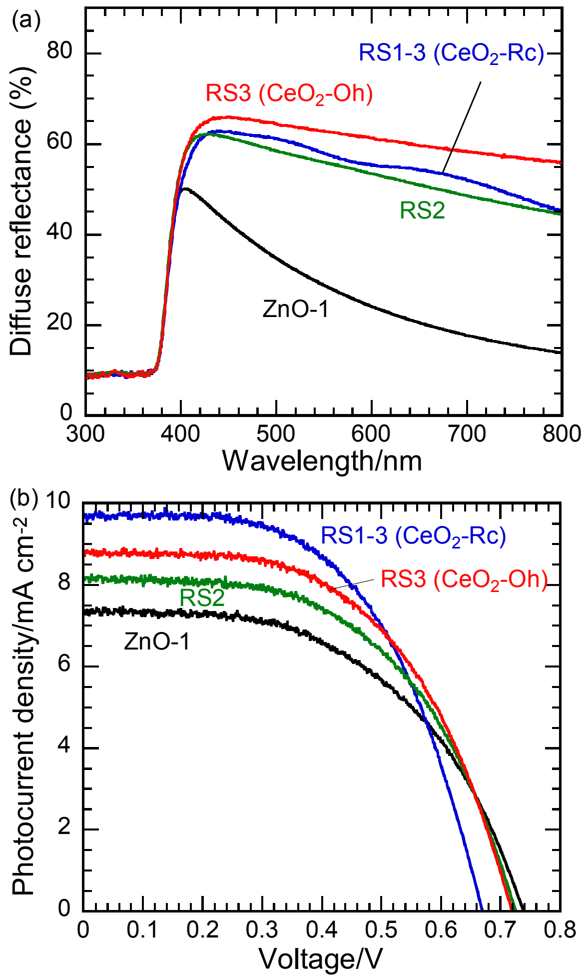

Fig. S6 (a) Diffuse reflectance spectra, measured from the substrate side, of the ZnO-1 films without or with the CeO_2 layers using the RS1-3 (CeO_2-Rc), RS2, or the RS3 (CeO_2-Oh) particles, and (b) *J–V* curves of the DSSCs using these films sensitized with N-719.

Table S2 Characteristics of DSSCs using the N719-sensitized ZnO and CeO_2/ZnO films.

Film	J_{sc}/mA cm^{-2}	V_{oc}/V	*ff* (-)	η (%)	Dye amount/10^{-8} mol cm^{-2}
ZnO-1	7.45	0.731	0.528	2.87	5.7
RS1-3/ZnO-1	9.85	0.664	0.550	3.60	10.4
RS2/ZnO-1	8.16	0.726	0.471	2.81	6.2
RS3/ZnO-1	9.27	0.713	0.542	3.58	8.0

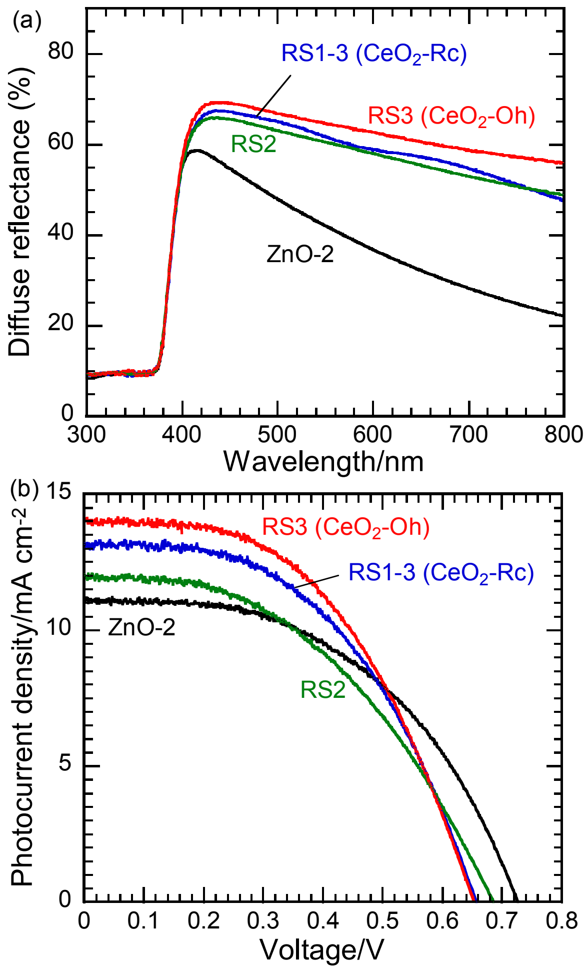

Fig. S7 (a) Diffuse reflectance spectra, measured from the substrate side, of the ZnO-2 films without or with the CeO_2 layers using the RS1-3 (CeO_2-Rc), RS2, or the RS3 (CeO_2-Oh) particles, and (b) *J*–*V* curves of the DSSCs using these films sensitized with N-719.

Table S3 Characteristics of DSSCs using the N719-sensitized ZnO and CeO_2/ZnO films.

Film	J_{sc}/mA cm^{-2}	V_{oc}/V	*ff* (-)	η (%)	Dye amount/10^{-8} mol cm^{-2}
ZnO-2	11.30	0.721	0.497	4.05	8.6
RS1-3/ZnO-2	13.38	0.662	0.493	4.35	10.5
RS2/ZnO-2	11.83	0.692	0.457	3.73	9.2
RS3/ZnO-2	14.14	0.651	0.471	4.34	11.0

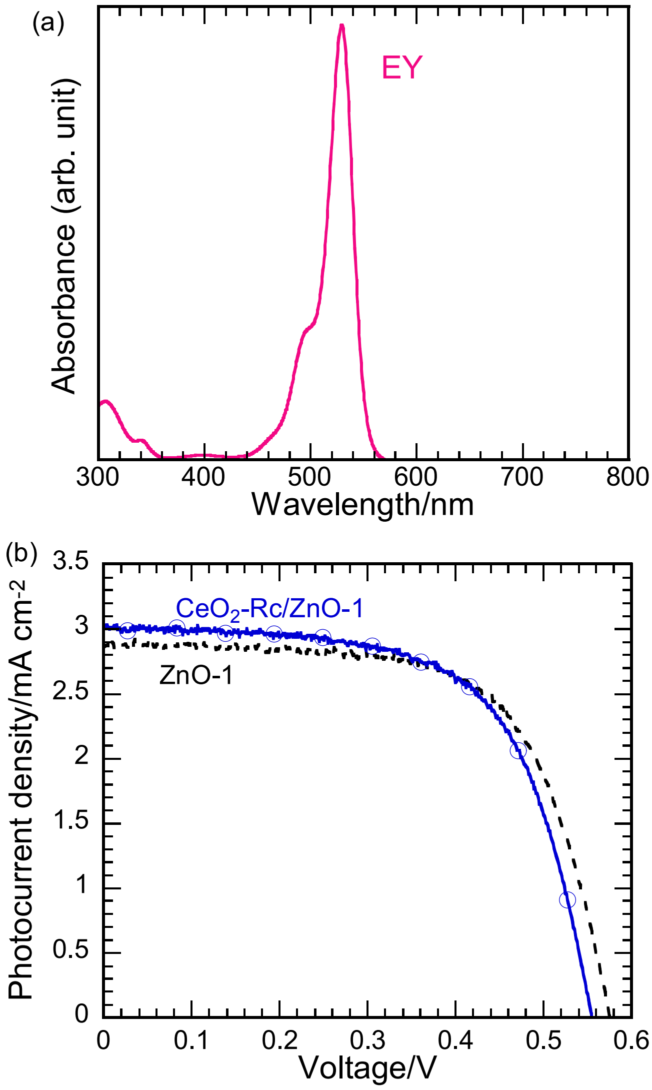

Fig. S8 (a) An absorption spectrum of a 3.0×10^{-4} mol dm^{-3} ethanol solution of eosin Y (EY), and (b) *J*–*V* curves of the DSSCs using the ZnO-1 and the CeO_2-Rc/ZnO-1 film sensitized with EY.

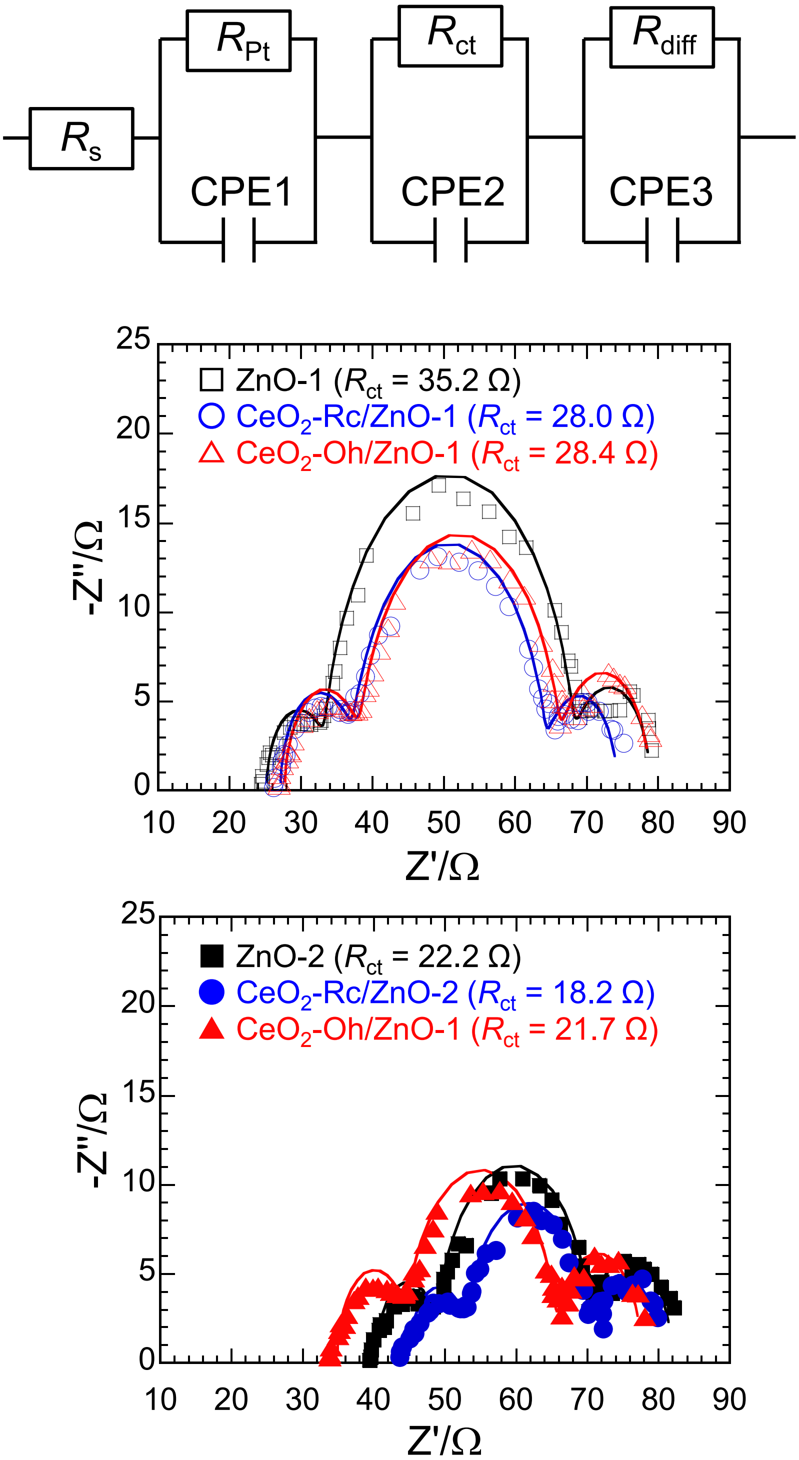

Fig. S9 An equivalent circuit model and EIS Nyquist plots of the DSSCs using the ZnO and the CeO_2/ZnO films sensitized with N-719. The EIS measurement was carried out using a frequency response analyzer (FRA, Solartron 1260A) under illumination with the AC amplitude of 10 mV and the frequency range from 10^5 to 10^{-2} Hz. The EIS fitting was performed using ZSimp Win 3.2 (EChem Software).