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Surfactant-Assisted Synthesis of Mesoporous Silica/Ceria-Silca Composites with High Cerium Content under Basic Conditions

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Table S1. Physicochemical properties of 3D bicontinuous cubic (*Ia*3*d*) silica/ceria-silica composites prepared by using a cationic surfactant under basic conditions.[a]

sample	$f_{Ce/Si}$	S_{BET} ($m^2\ g^{-1}$)	V_t ($cm^3\ g^{-1}$)	$V_{textural}$ ($cm^3\ g^{-1}$)	D_{KJS} (nm)	*d*-spacing (nm)	*a* (nm)	*w* (nm)
CCS-20	0.2	637	0.64	0.46	3.4	3.685	9.03	1.2
CCS-30	0.3	543	0.56	0.38	3.5	3.685	9.03	1.2
CCS-40	0.4	455	0.50	0.30	3.4	3.689	9.04	1.2
CCS-50	0.5	356	0.42	0.23	3.4	3.672	9.00	1.2

[a]Notation: $f_{Ce/Si}$ - molar ratio of cerium hydroxide to tetraethylorthosilicate used in the synthesis gel; S_{BET} - BET specific surface area determined in the range of relative pressures from 0.04 to 0.2; V_t - single-point pore volume at $P/P_o = 0.99$; $V_{textural}$ - volume of textural pores obtained by *t*-plot analysis; D_{KJS} - mesopore diameter at the maximum of the PSD curve obtained by the improved KJS method;[52] *d*-spacing - Bragg's spacing ($= 2\pi/q^*$: q^* is q value at maximum (211) peak for *Ia*3*d* mesostructure); *a* - unit cell parameter ($=\sqrt{6}d_{211}$ for *Ia*3*d* mesostructure); *w* - pore wall thickness ($= a/3.0919 - D_{KJS}/2$ for *Ia*3*d* mesostructure).[53]

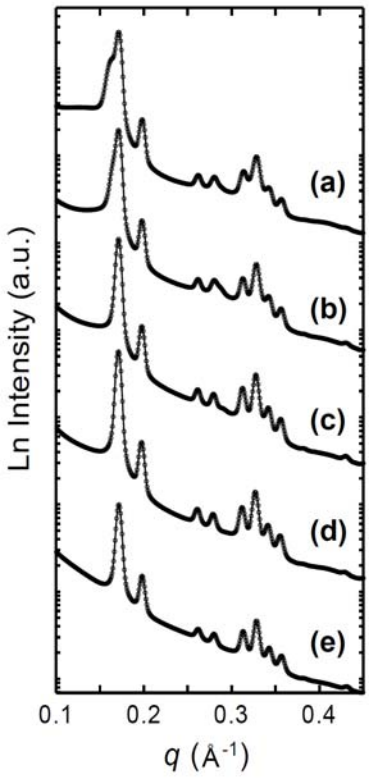

Figure S1. Synchrotron SAXS patterns of bicontinuous cubic (*Ia*3*d*) mesoporous silica/ceria-silica composite samples prepared under basic conditions. The sequence of the SAXS patterns from (b) to (e) corresponds to the list of samples in Table S1: (b) CCS-20, (c) CCS-30, (d) CCS-40, and (e) CCS-50, respectively. The pattern (a) is for the mesoporous silica/ceria-silica sample corresponding to the Ce/Si ratio in the synthesis gel = 0.1.

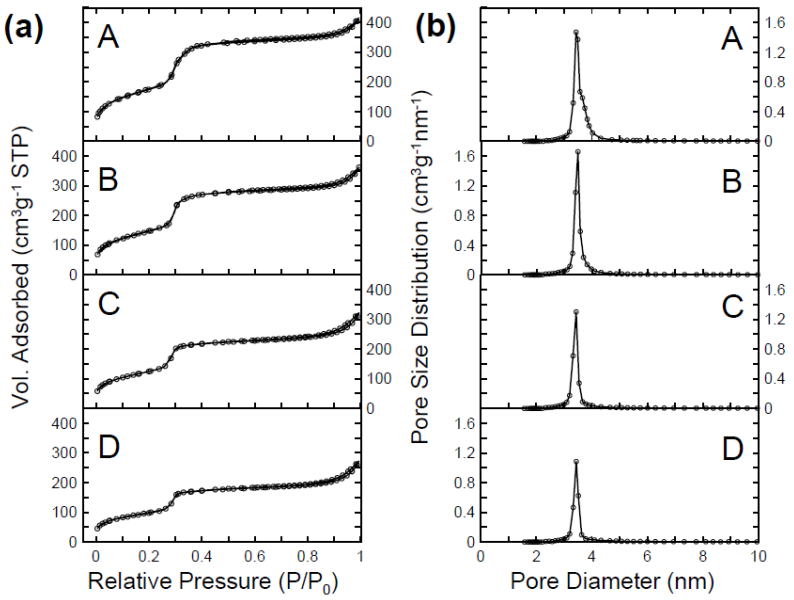

Figure S2. Nitrogen adsorption-desorption isotherms (a) and the corresponding pore size distributions (b) for bicontinuous cubic (*Ia*3*d*) mesoporous silica/ceria-silica composites prepared under basic conditions. The sequence of the isotherms from A to D refers to the following samples: (A) CCS-20, (B) CCS-30, (C) CCS-40, and (D) CCS-50.

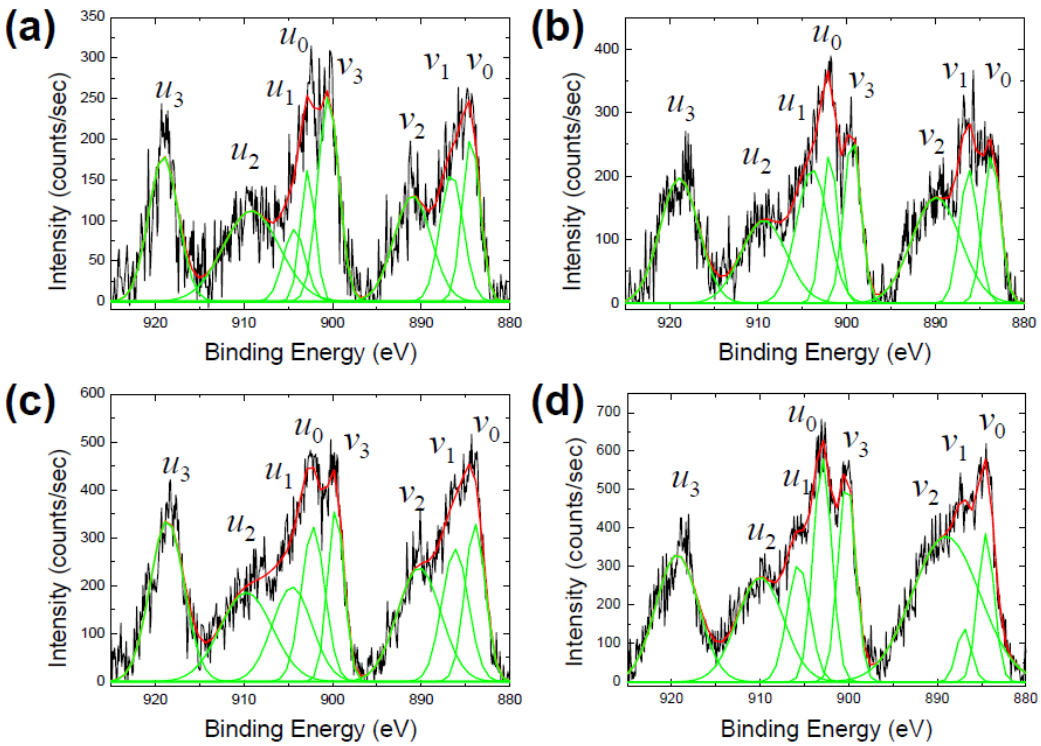

Figure S3. XPS patterns of the Ce 3d core level spectra and the deconvoluted eight peaks by a Gaussian fitting method for mesoporous silica/ceria-silica composites prepared under basic conditions. The XPS patterns are (a) HCS-20, (b) HCS-30, (c) HCS-40 and (d) HCS-50, respectively. The series of *v* denotes Ce $3d_{5/2}$ and *u* denotes Ce $3d_{3/2}$, where the peaks of v_1 and u_1 belong to Ce^{3+} ion and the other peaks belong to Ce^{4+}.

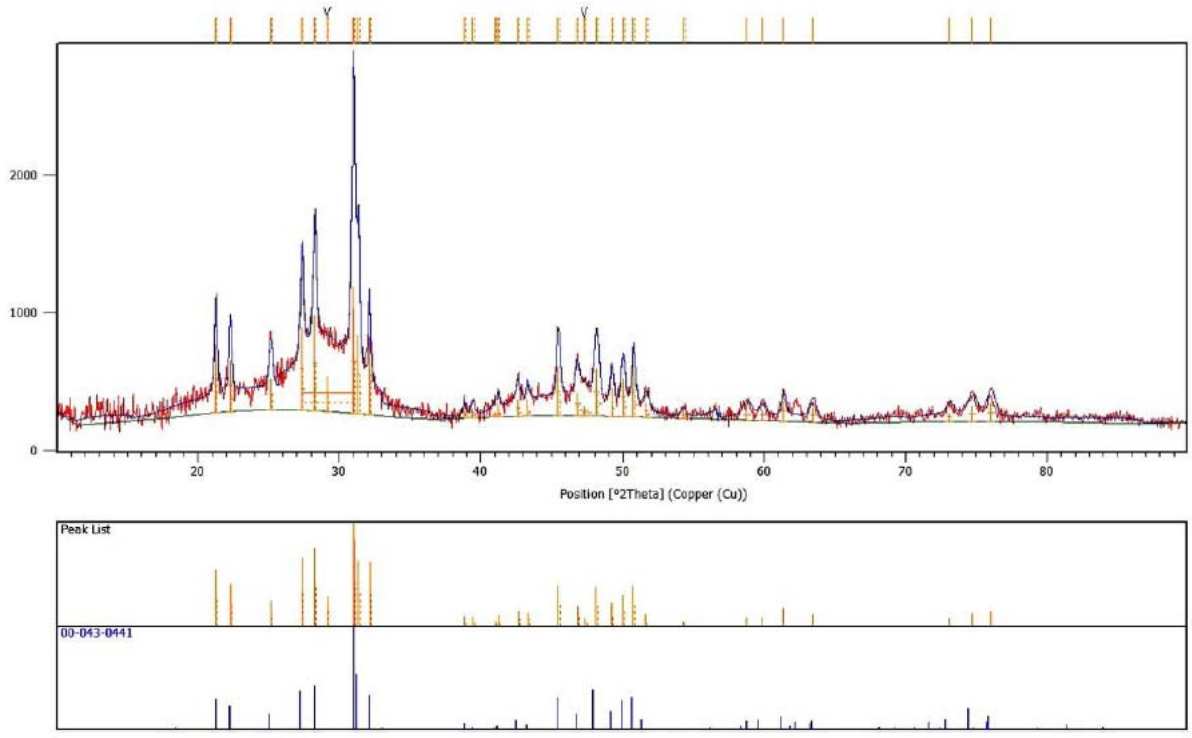

Figure S4. Wide angle X-ray diffraction patterns of the reduced HCS-50HR sample and the corresponding JCPDS reference.

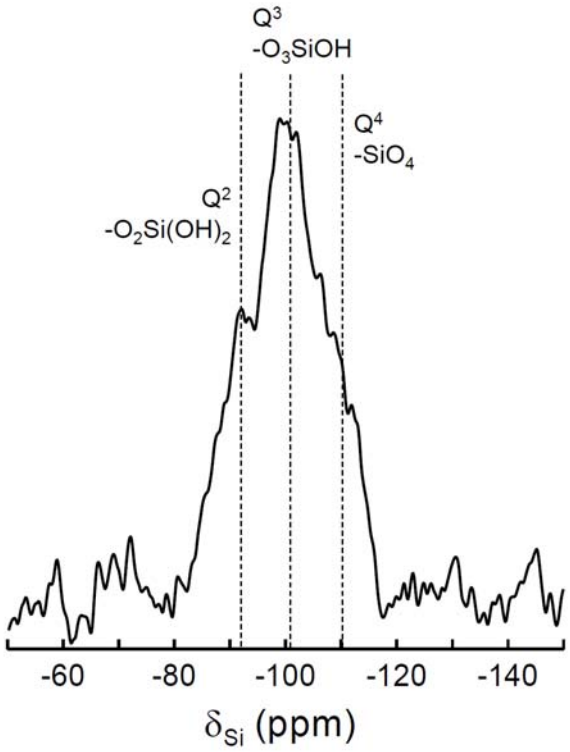

Figure S5. Solid state ^{29}Si CP MAS NMR spectra of the reduced HCS-50HR sample.