Molecular Design of the Surfactant and the Co-Structure-Directing Agent (CSDA) toward Rational Synthesis of Targeted Anionic Surfactant Templated Mesoporous Silica

Electronic Supplementary Information (ESI)

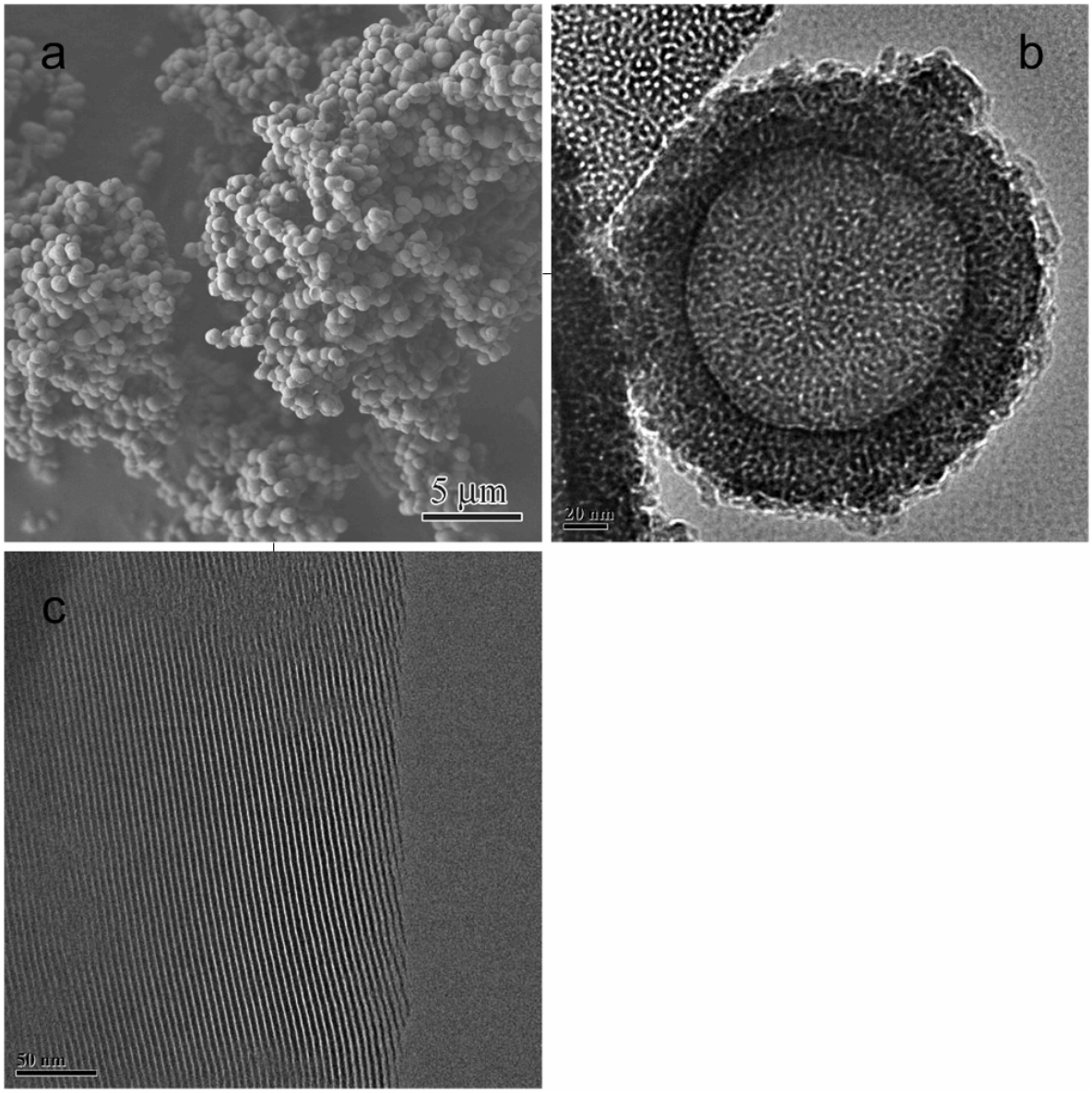

Fig. S1 SEM (a) and TEM (b) images of the mesoporous silica synthesized with sodium dodecyl sulfonate (SDSF) as the SDA and TMAPS as the CSDA. The main phase is concrete spheres and the minor part is hollow spheres. TEM(c) image of the mesoporous silica synthesized with sodium dodecyl phosphate (SDP) as the SDA and TMAPS as the CSDA.

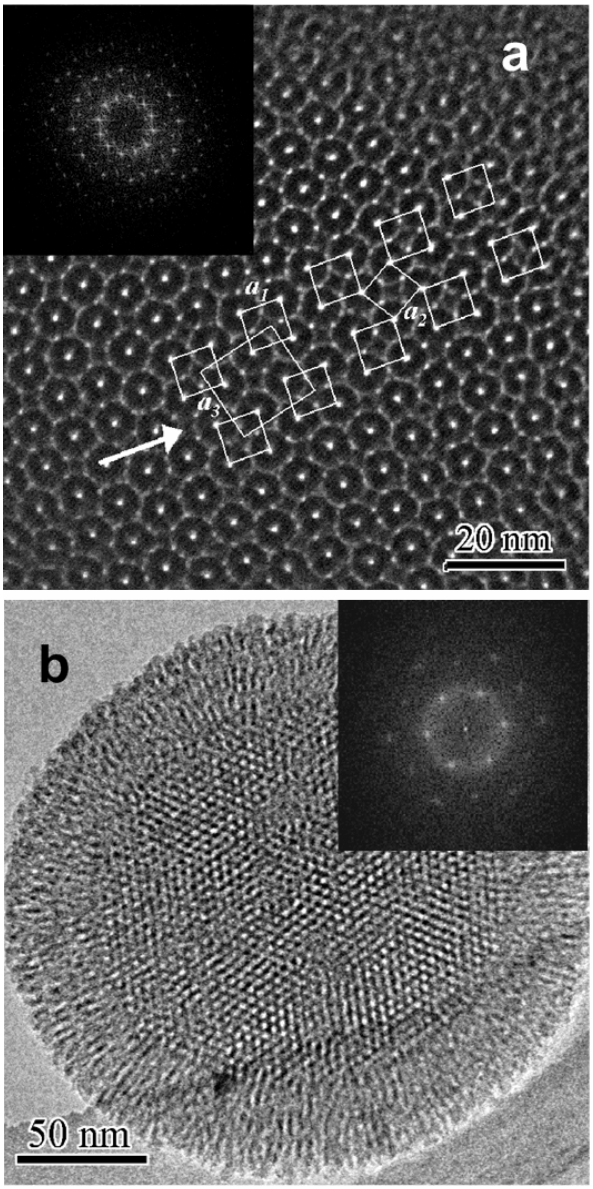

Fig. S2 HRTEM images of the mesoporous silicas AMS-2 and AMS-1 with XRD patterns shown in (a) Fig. 3c and (b) Fig. 3f, respectively.

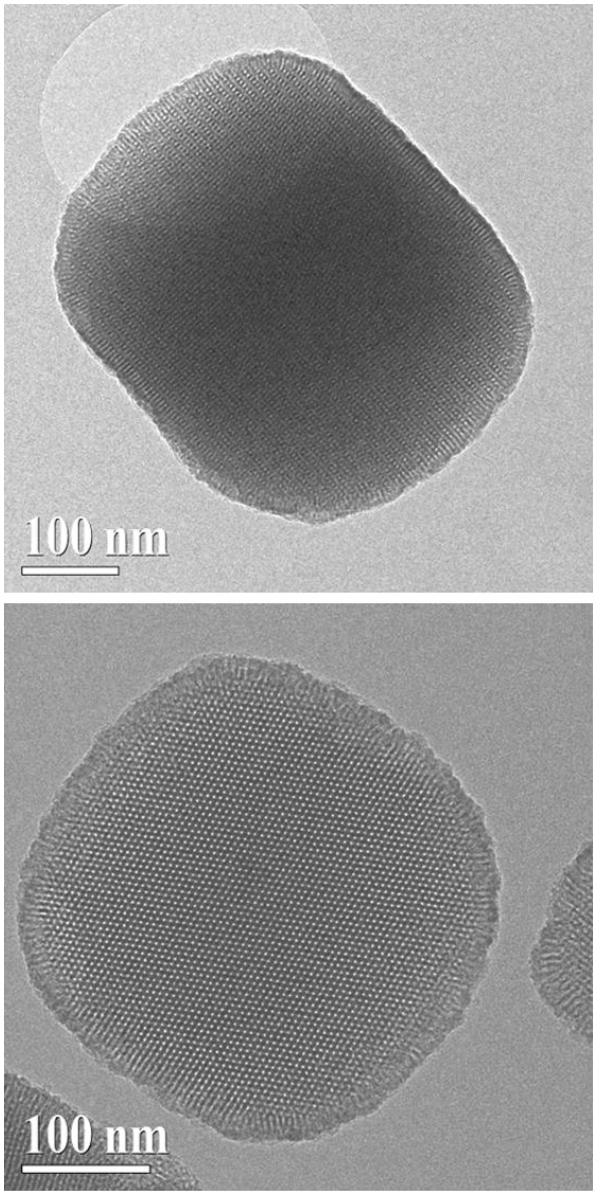

Fig. S3 HRTEM images of the calcined mesoporous silica synthesized with C_{16}GluA as the SDA and APS as the CSDA. The HRTEM image taken along [100] direction is shown in Fig. 5b.

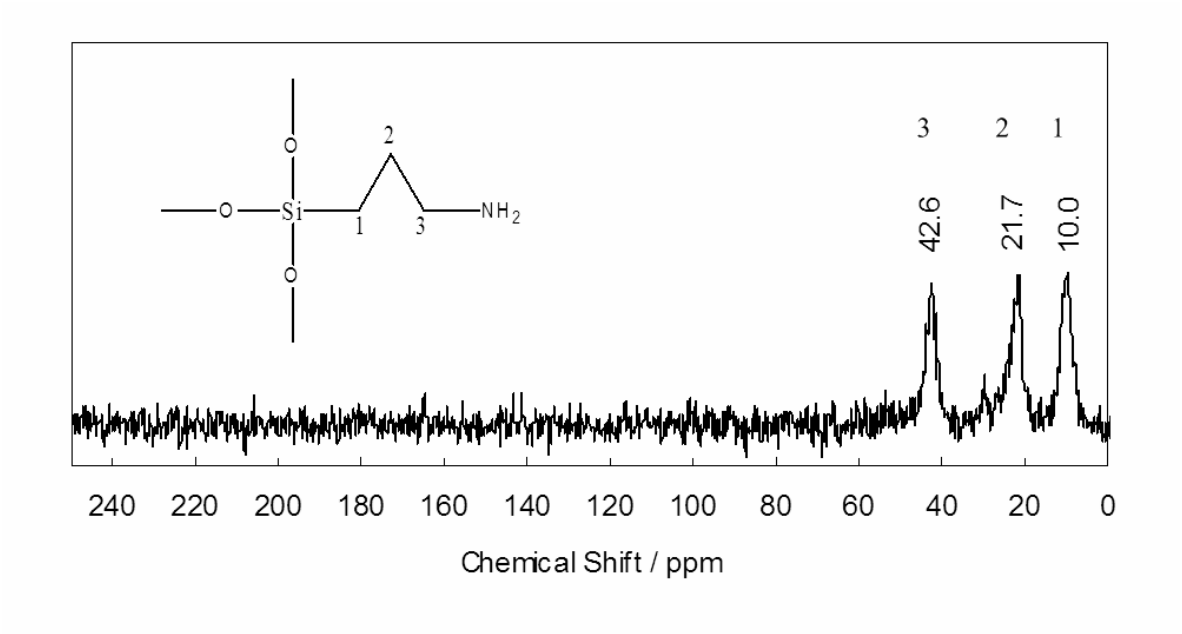

Fig. S4 ^{13}C CP MAS NMR of the extracted mesoporous silica synthesized with C_{18}GluA as the SDA and APS as the CSDA (APS/C_{18}GluA = 6). The amino groups are reserved after the removal of surfactant.

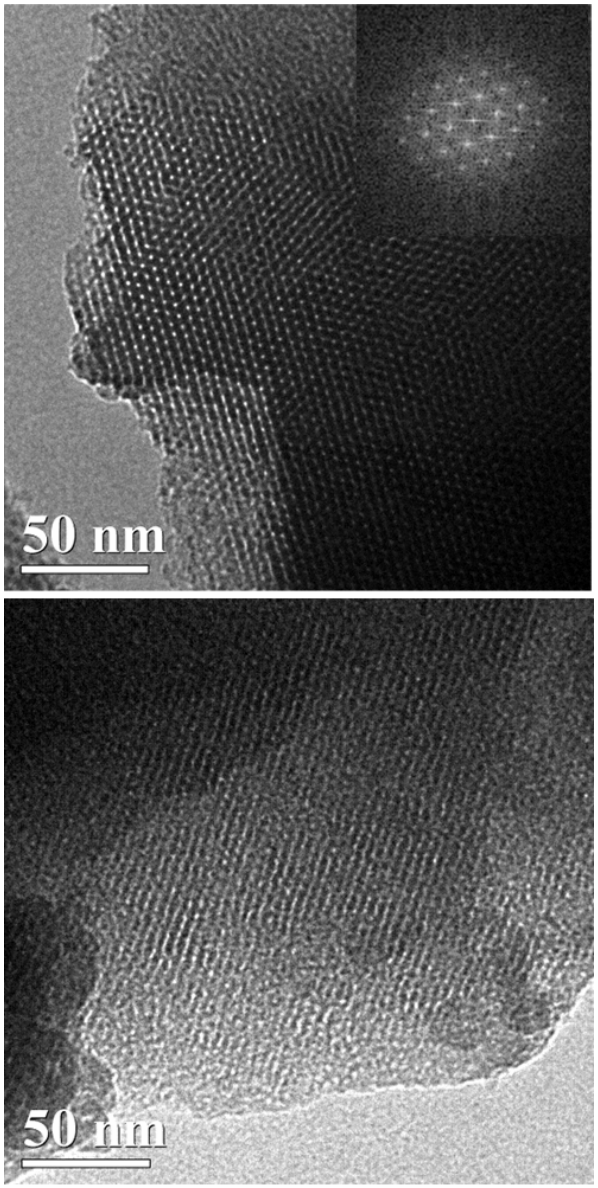

Fig. S5 TEM images of calcined mesoporous silica synthesized with $C_{16}AA$ as the SDA and APS as the CSDA. The molar composition of the reaction mixture is: $C_{16}AA/APS/TEOS/H_2O$ = 1: 6: 7: 1422.

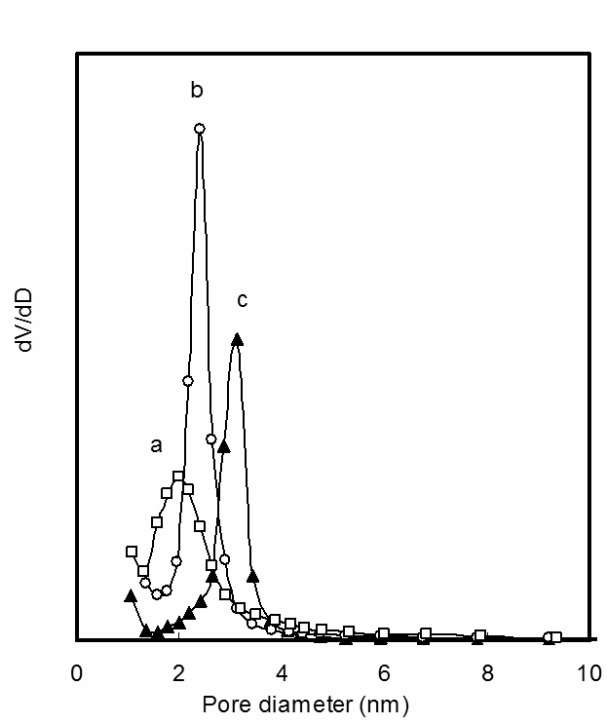

Fig. S6 Pore size distributions (BJH) of calcined mesoporous silicas synthesized with SDSF (a), SDS (b), and SDP (c), respectively, calculated with BJH method. The d*V*/d*D* values of mesoporous silica synthesized with SDSF were multiplied by 5. The isotherms are shown in Fig. 2.

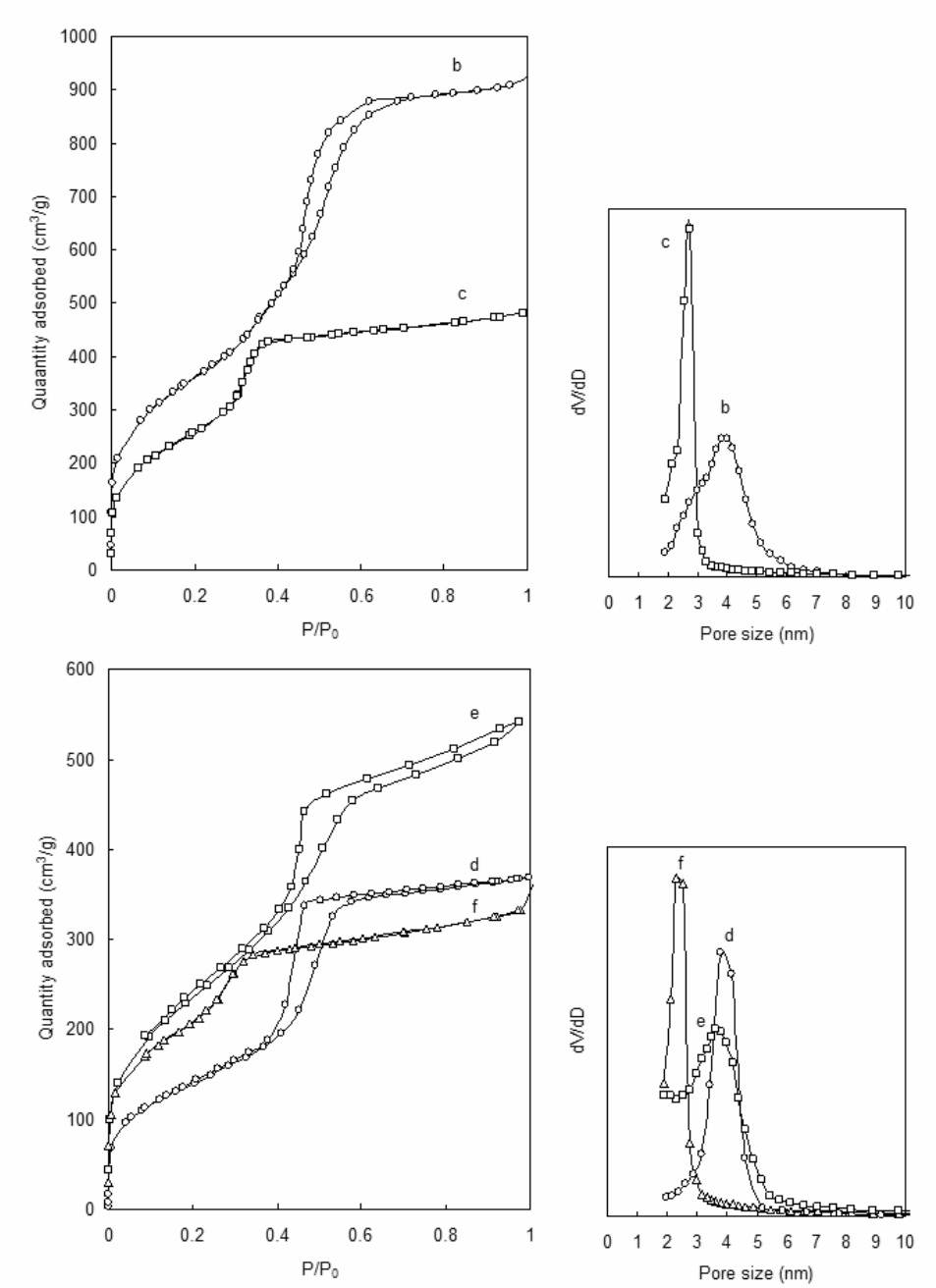

Fig. S7 Nitrogen adsorption isotherms and pore size distributions (BJH) of the mesoporous silica synthesized with surfactants of different head groups as the SDA. The surfactants used in the syntheses are: (b) C_{12}AlaA, (c) C_{12}GluA, (d) C_{14}AS, (e) C_{14}GlyS, and (f) $C_{14}GluS_2$, respectively. The XRD patterns are shown in Fig. 3.

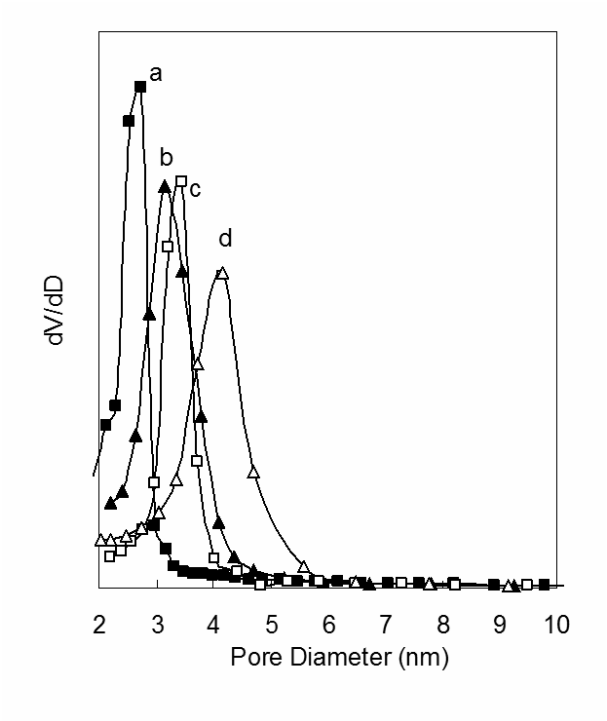

Fig. S8 Pore size distributions (BJH) of the calcined mesoporous silicas synthesized with C_nGluA of different chain lengths (*n*) as the SDA and APS as the CSDA: (a) *n* = 12, (b) *n* = 14, (c) *n* = 16 and (d) *n* = 18. The isotherms are shown in Fig. 6.

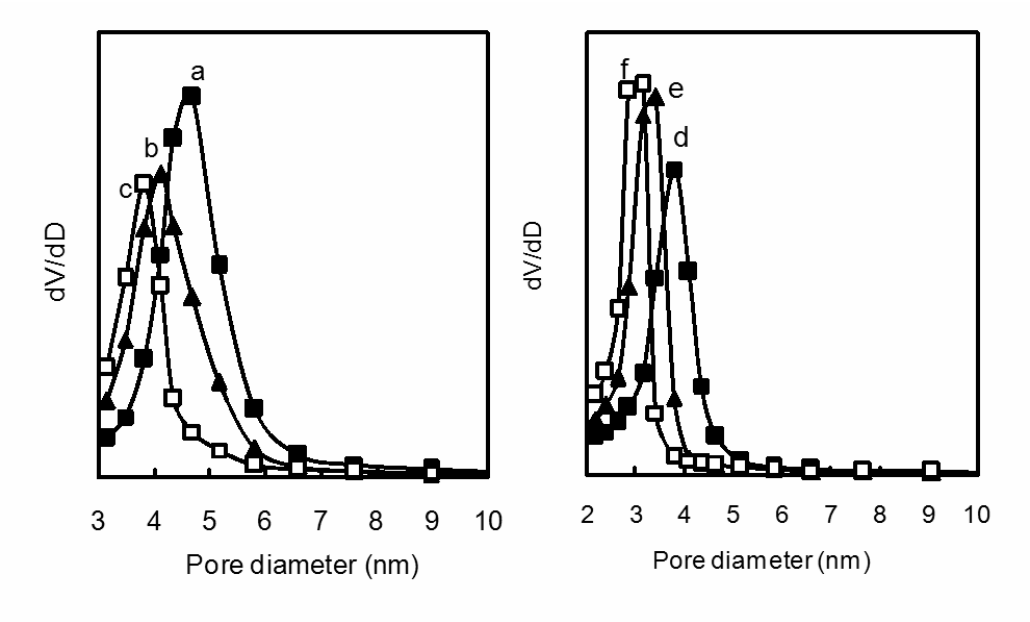

Fig. S9 Pore size distributions (BJH) of the calcined mesoporous silicas synthesized with C_{14}GluA and different types of CSDA: (a, d) APS, (b, e) MAPS, (c, f) DMAPS. The ratios of the HCl/C_{14}GluA = 1.0 (a, b, c) and 0.8 (d, e, f). The isotherms are shown in Fig. 9.

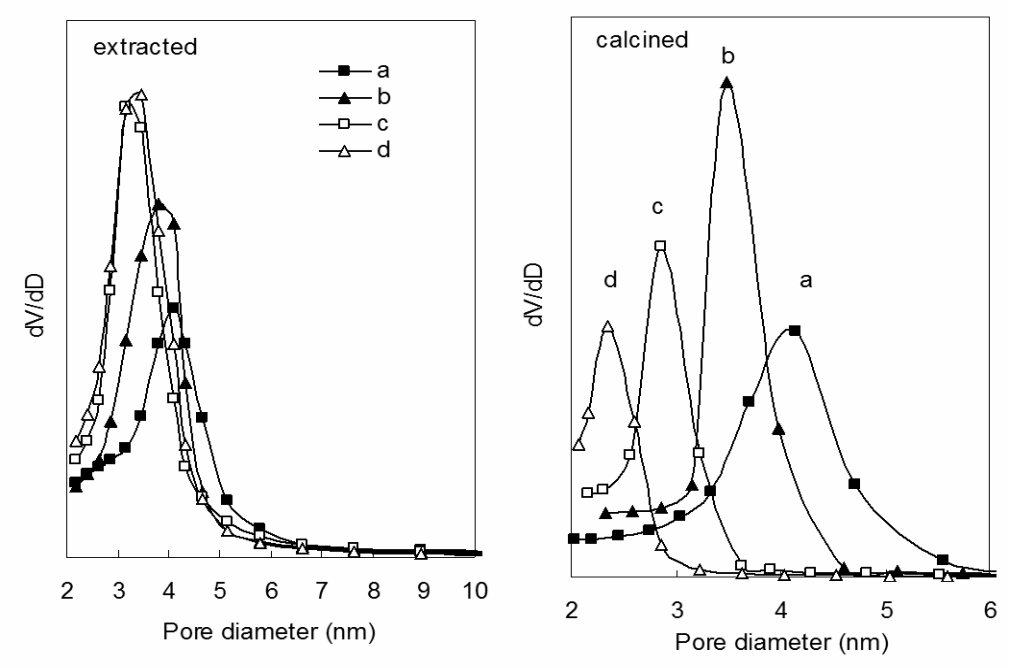

Fig. S10 Pore size distributions (BJH) of the extracted and calcined mesoporous silicas synthesized with C_{18}GluA as the SDA and different amount of APS as the CSDA so that: (a) APS/C_{18}GluA = 2; (b) APS/C_{18}GluA = 4; (c) APS/C_{18}GluA = 6 and (d) APS/C_{18}GluA = 8. The isotherms are shown in Fig. 12.