Green Synthesis of Surfactant-free Mesoporous Silica with Strong Hydrophilicity via Metal Salt Modifications for Moisture Adsorption
Super-hydrophilic Surfactant-free Mesoporous Silica

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Supplementary data

Table S1 Percentage of hydrophilic functional groups (Si-O- and Si-OH) of metal salt–modified mesoporous silica.

Figure S1: TEM images of (a) MPS and NaCl-modified MPS products: (b) MPS_0.125NaCl, (c) MPS_0.250NaCl, (d) MPS_0.375NaCl, and (e) MPS_0.500NaCl.

Figure S2: TEM images of (a) MPS and $MgCl_2$-modified MPS products: (b) MPS_0.125$MgCl_2$, (c) MPS_0.250$MgCl_2$, (d) MPS_0.375$MgCl_2$, and (e) MPS_0.500$MgCl_2$.

Figure S3: FTIR spectra of (a) silica gel, (b) MPS and MPS modified by (A) NaCl, (B) KCl, (C) $MgCl_2$, and (D) $CaCl_2$ salts with concentrations of 0.125 (c, g, k, o); 0.250 (d, h, l, p); 0.375 (e, i, m, q); and 0.500 (f, j, n, r) g salt/g SiO_2.

Figure S4: DTG curves of silica gel, MPS and MPS modified by (A) NaCl, (B) KCl, (C) $MgCl_2$, and (D) $CaCl_2$ salts.

Table S1 Percentage of hydrophilic functional groups (Si-O- and Si-OH) of metal salt–modified mesoporous silica.

Adsorbents	Percentage of hydrophilic functional group [a] (%)	
	$Si\text{-}O^-$	Si-OH
Silica gel	4.91	2.86
MPS	4.48	2.75
MPS_0.125NaCl	4.66	2.50
MPS_0.250NaCl	4.85	2.60
MPS_0.375NaCl	5.09	2.70
MPS_0.500NaCl	5.47	3.04
MPS_0.125KCl	4.28	2.65
MPS_0.250KCl	4.62	2.82
MPS_0.375KCl	4.67	2.83
MPS_0.500KCl	4.93	2.95
MPS_0.125$MgCl_2$	4.66	2.50
MPS_0.250$MgCl_2$	3.49	2.18
MPS_0.375$MgCl_2$	3.03	1.83
MPS_0.500$MgCl_2$	2.30	1.40
MPS_0.125$CaCl_2$	1.27	0.84
MPS_0.250$CaCl_2$	1.22	0.84
MPS_0.375$CaCl_2$	1.18	0.78
MPS_0.500$CaCl_2$	1.12	0.75

[a] Calculated by using area from deconvolution of FTIR spectra.

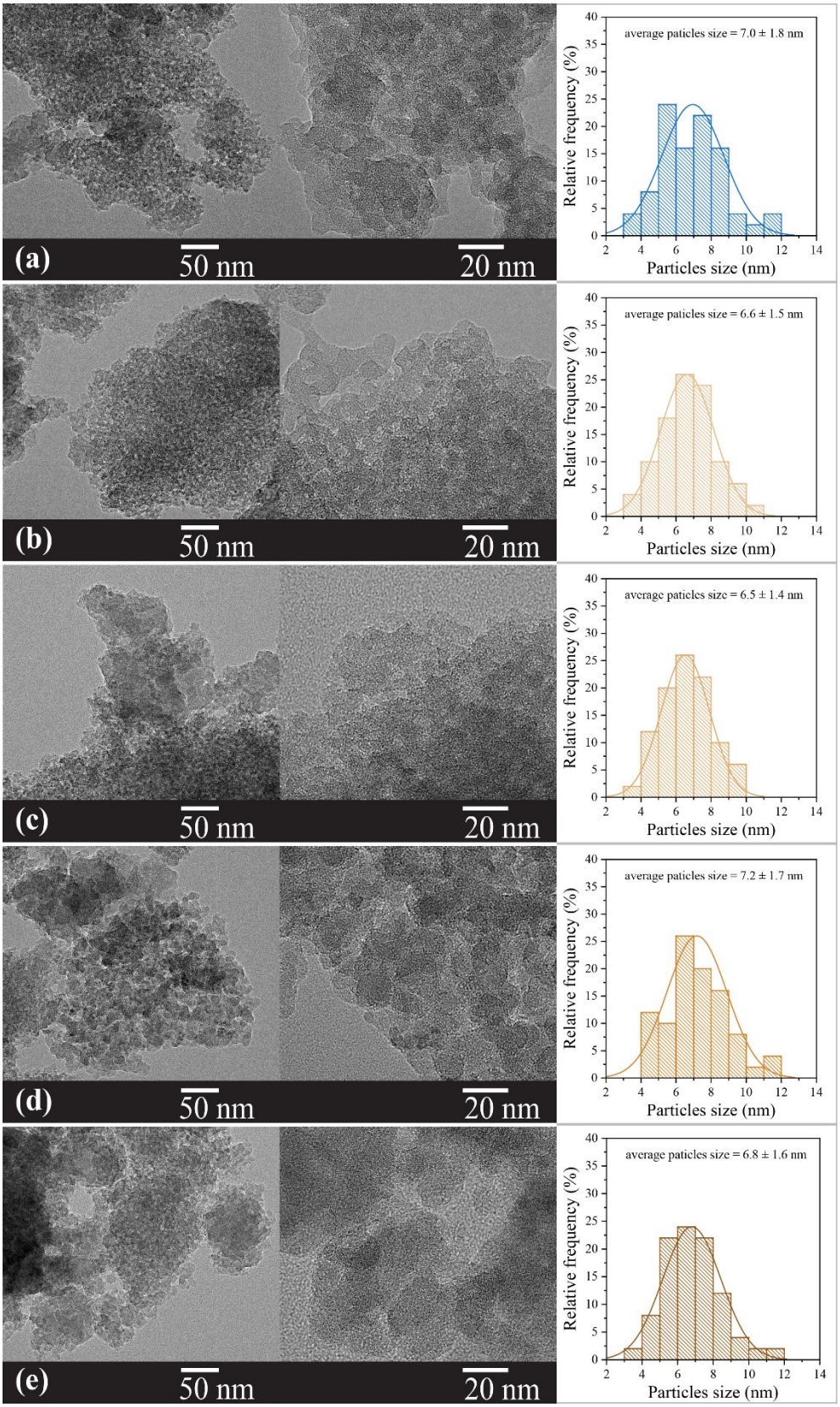


Figure S1: TEM images and particle size distributions of (a) MPS and NaCl-modified MPS products: (b) MPS_0.125NaCl, (c) MPS_0.250NaCl, (d) MPS_0.375NaCl, and (e) MPS_0.500NaCl.

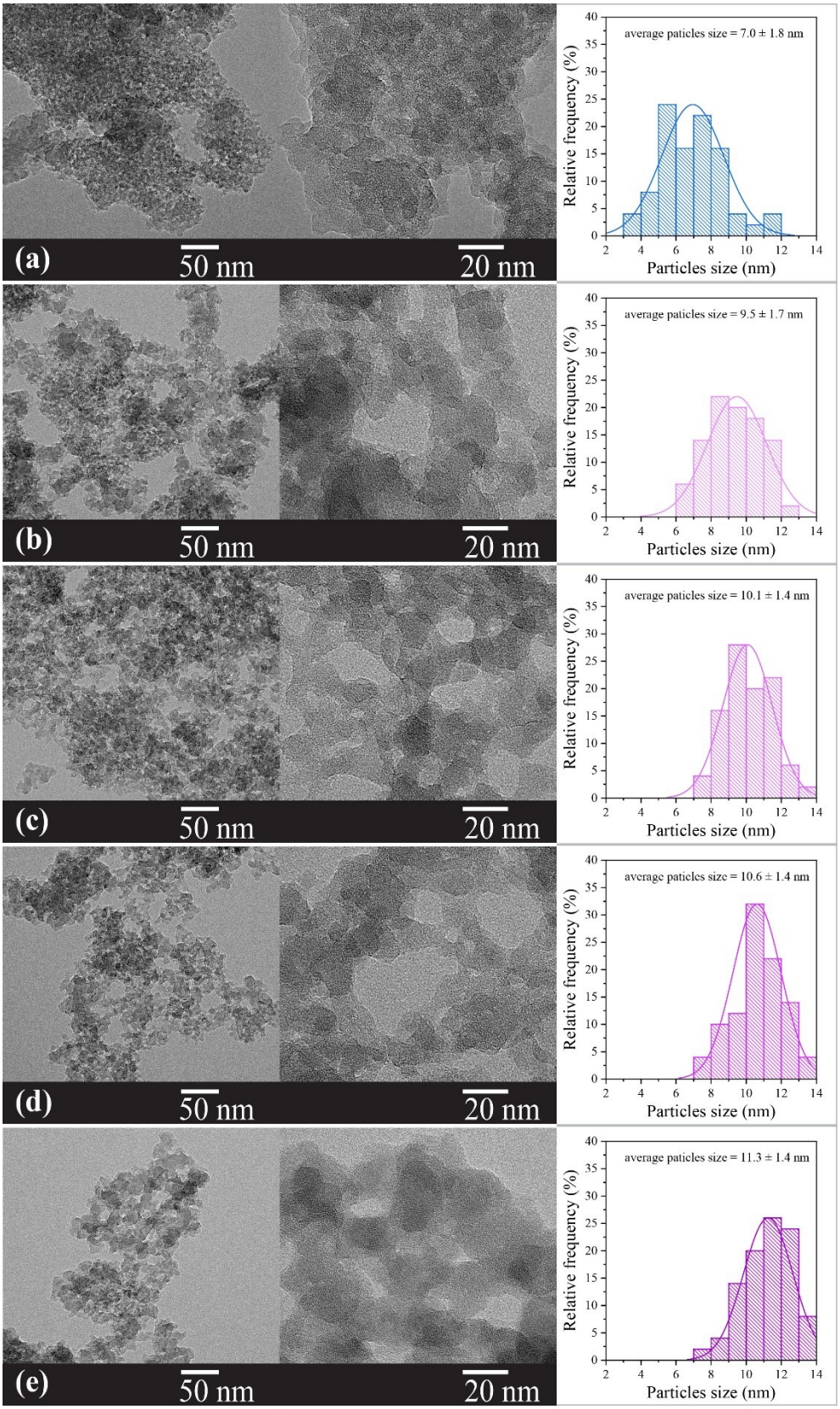
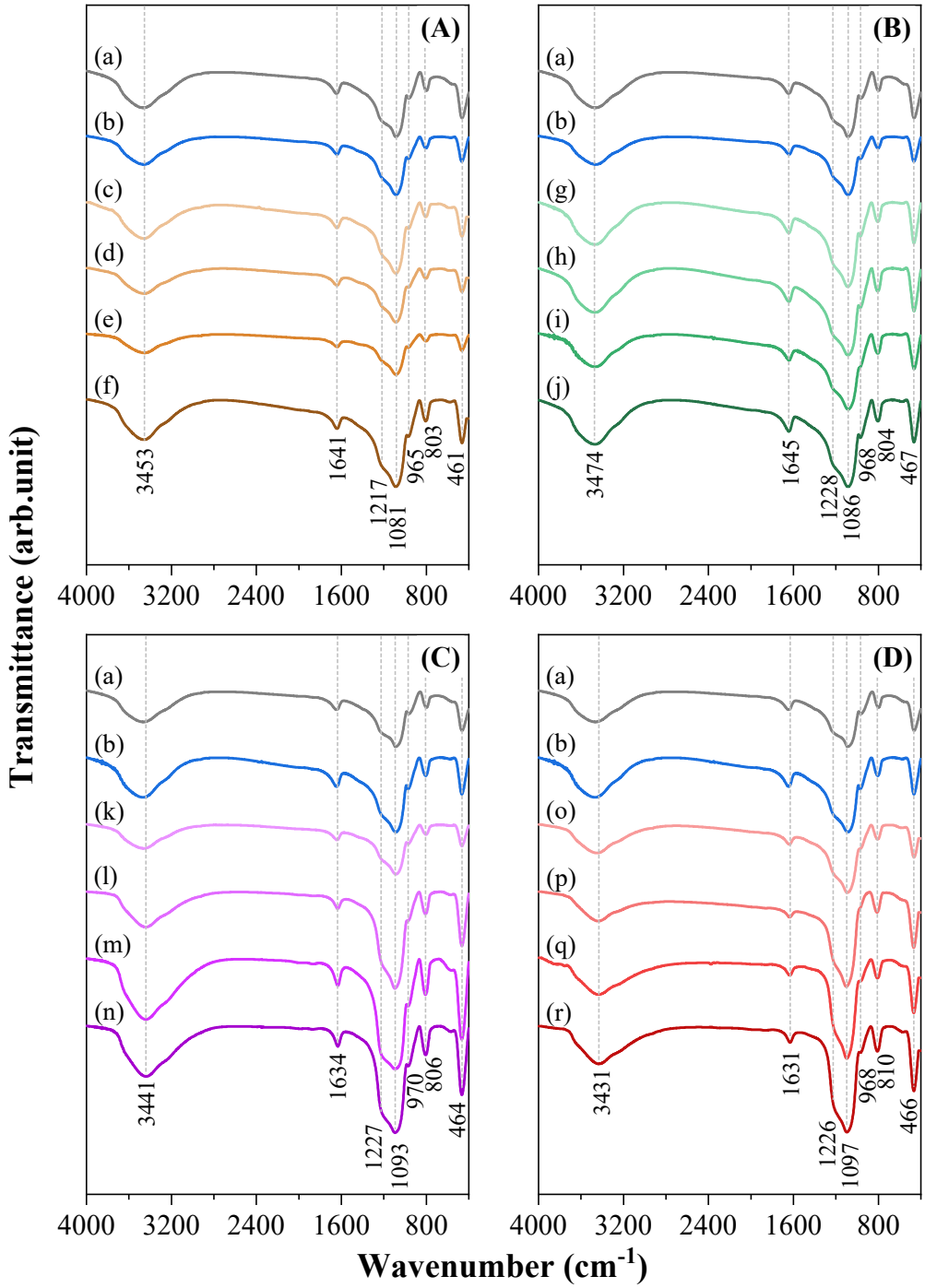


Figure S2: TEM images and particle size distributions of (a) MPS and $MgCl_2$-modified MPS products: (b) MPS_0.125$MgCl_2$, (c) MPS_0.250$MgCl_2$, (d) MPS_0.375$MgCl_2$, and (e) MPS_0.500$MgCl_2$.



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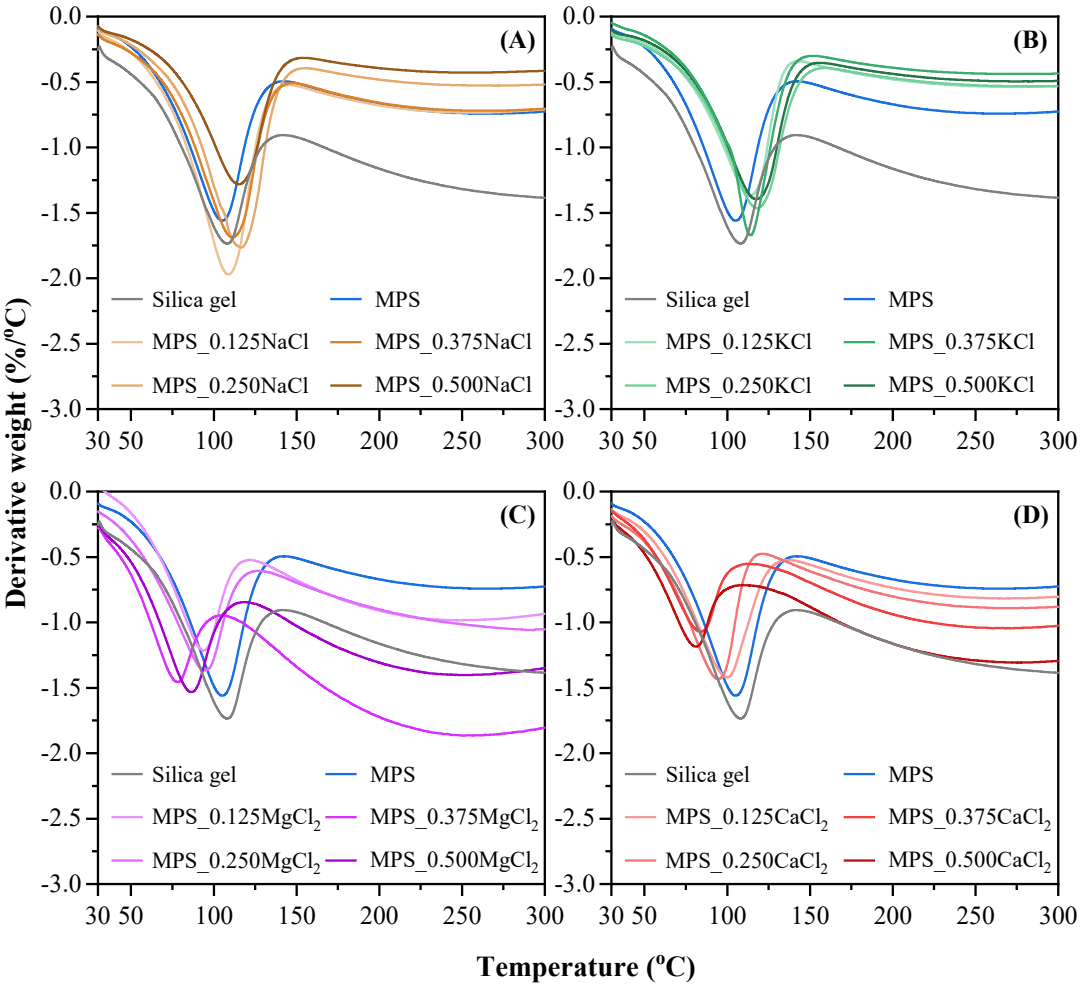

Figure S4: DTG curves of silica gel, MPS and MPS modified by (A) NaCl, (B) KCl, (C) $MgCl_2$, and (D) $CaCl_2$ salts.