

Supplementary information

Controllable in-situ growth of highly-dispersed nano-SiO₂ on steel slag powder for enhancing cement-based materials

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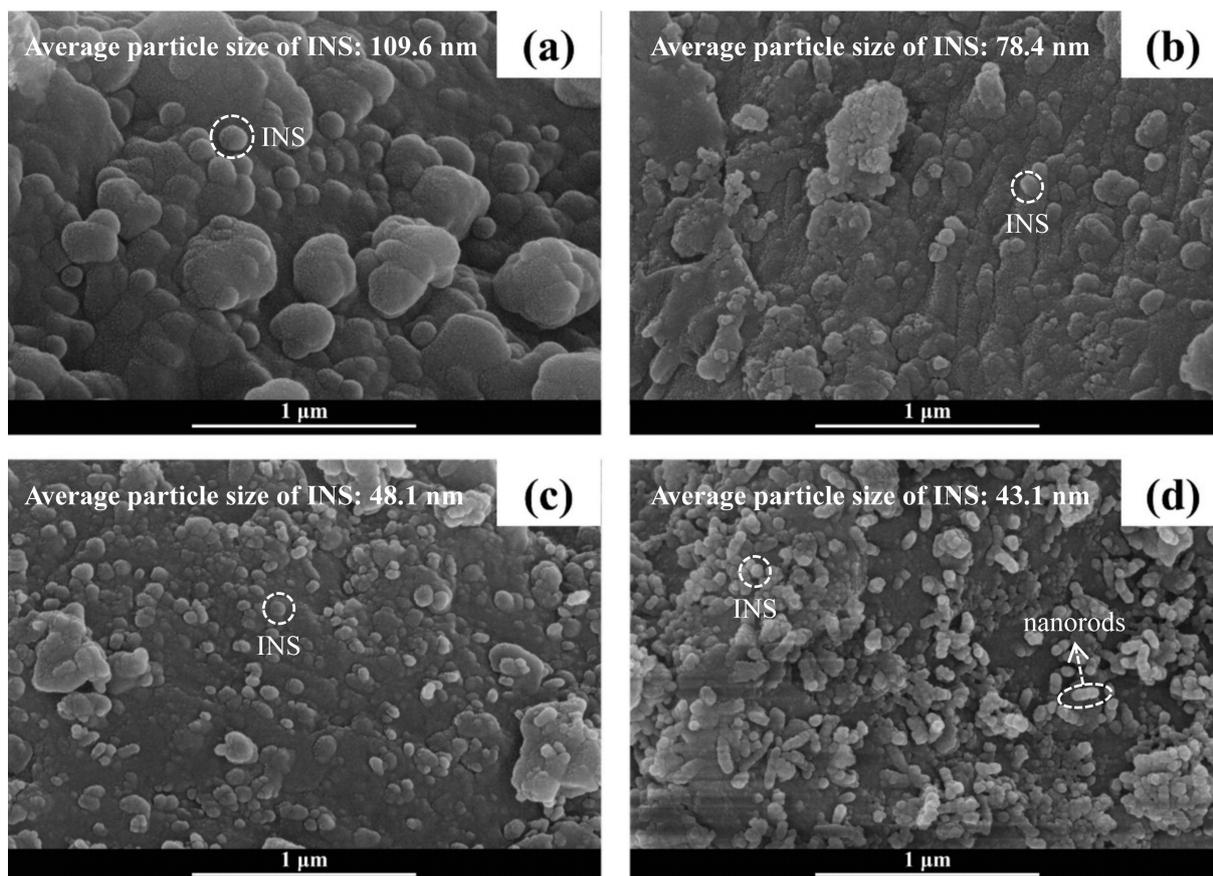


Figure S1: The SEM images of NS@SSP synthesized with different W/E ratios:

(a) W/E-1; (b) W/E-2; (c) W/E-3; (d) W/E-4.

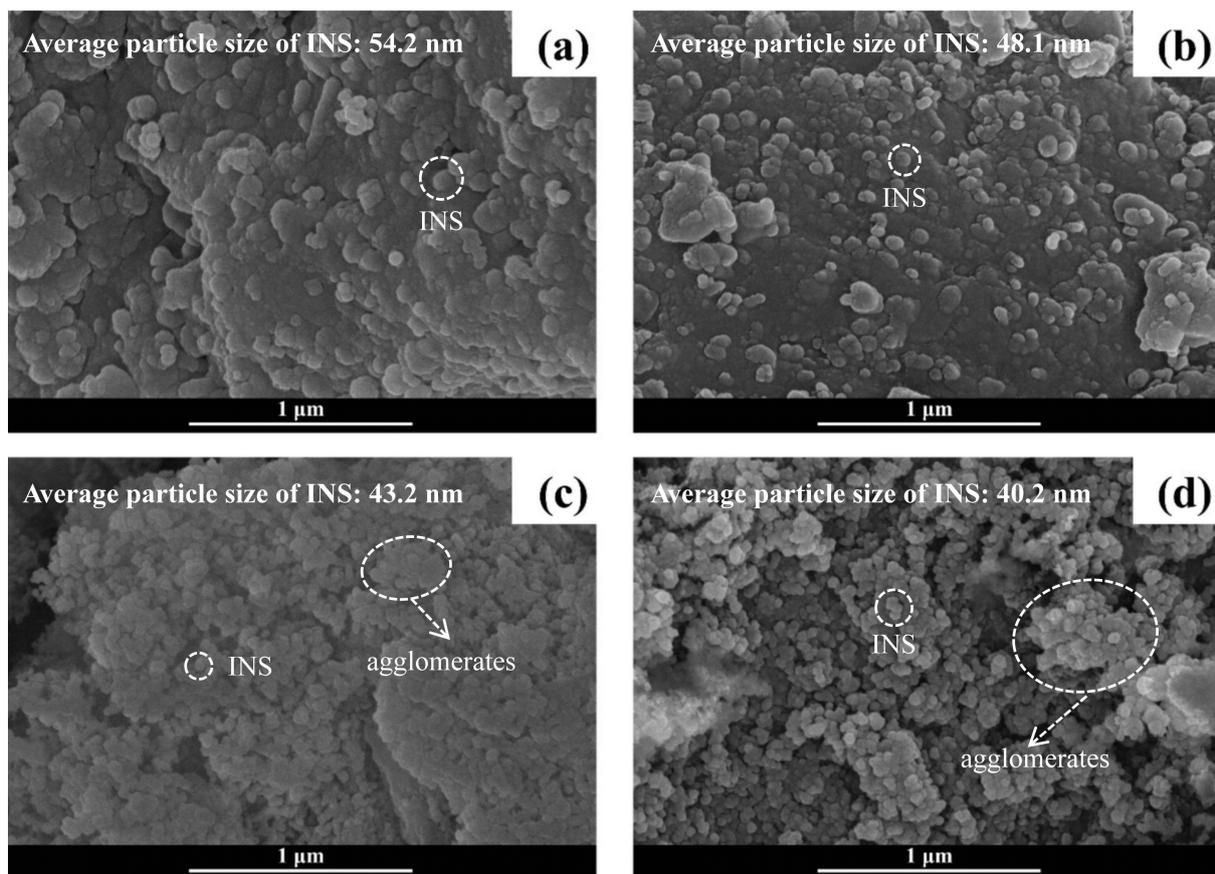


Figure S2: The SEM images of NS@SSP synthesized with different TEOS concentrations:

(a) TEOS-1; (b) TEOS-2; (c) TEOS-3; (d) TEOS-4.

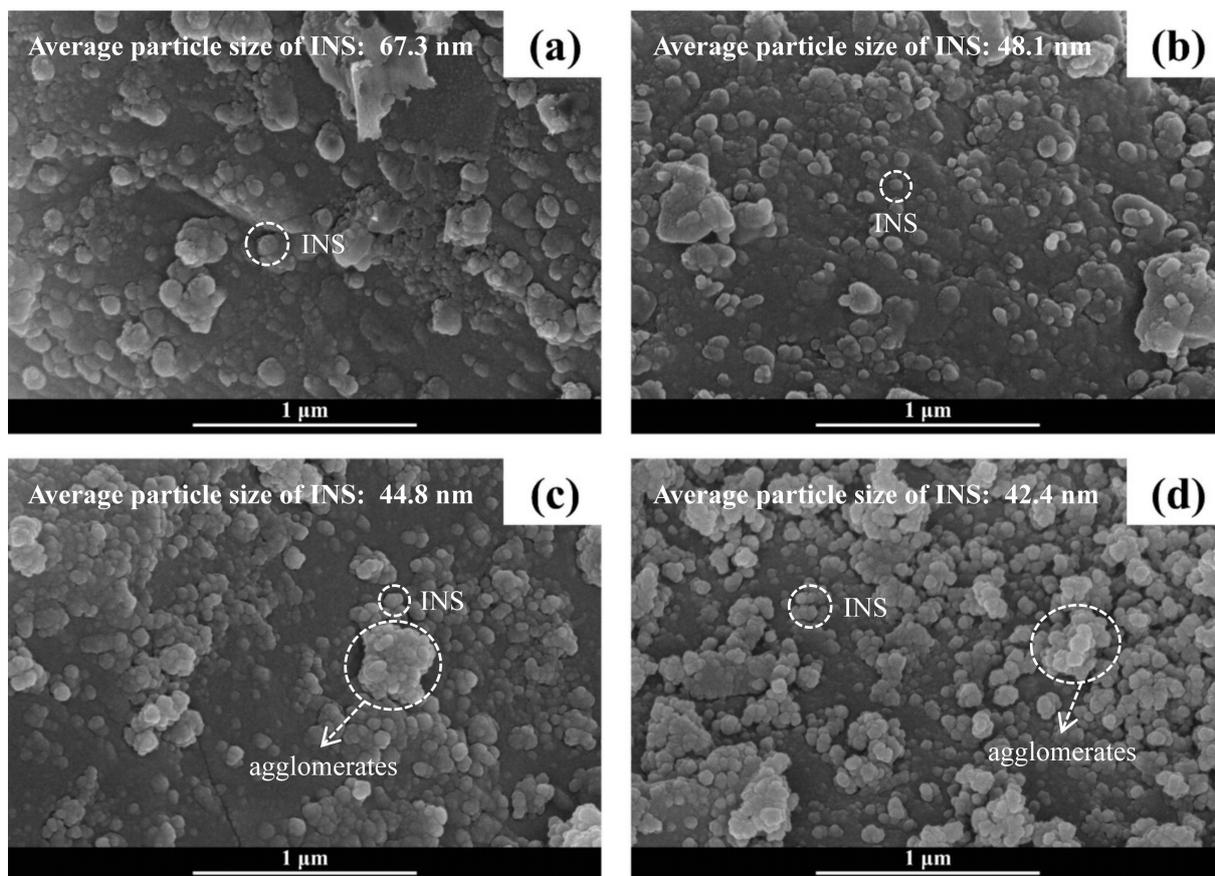


Figure S3: The SEM images of NS@SSP synthesized at different reaction temperatures:
 (a) 30°C; (b) 40°C; (c) 50°C; (d) 60°C.

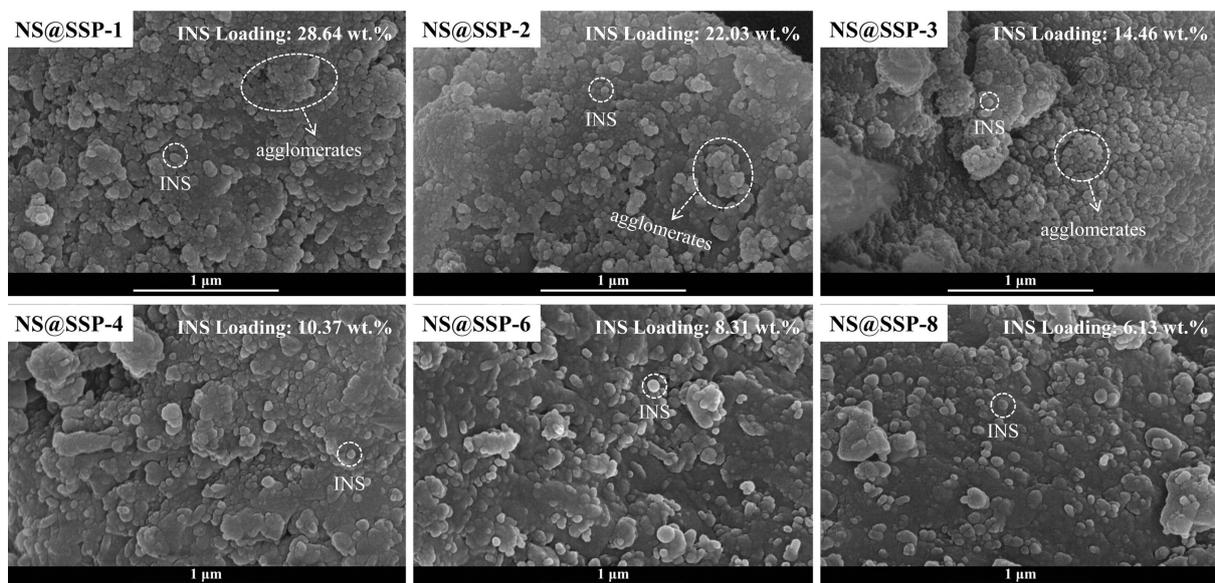


Figure S4: SEM images of NS@SSP synthesized with varying SSP dosages.

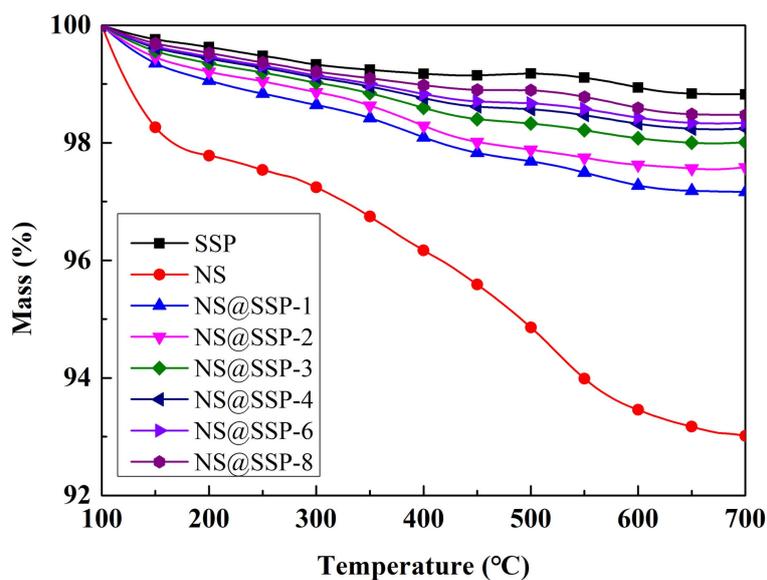


Figure S5: TG curves of NS@SSP synthesized with varying SSP dosages.

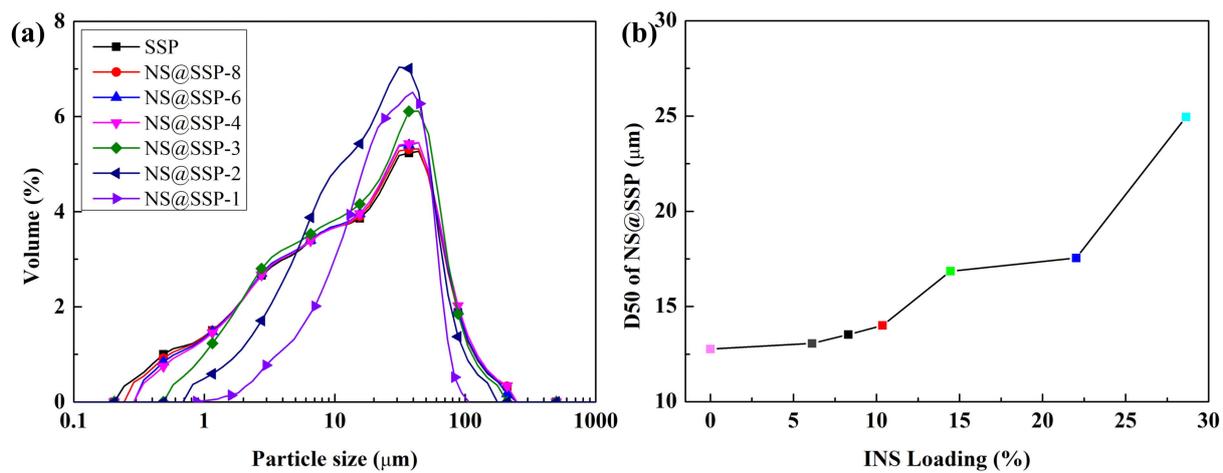


Figure S6: (a) Particle size distribution and (b) D50 of NS@SSP with varying INS loadings.

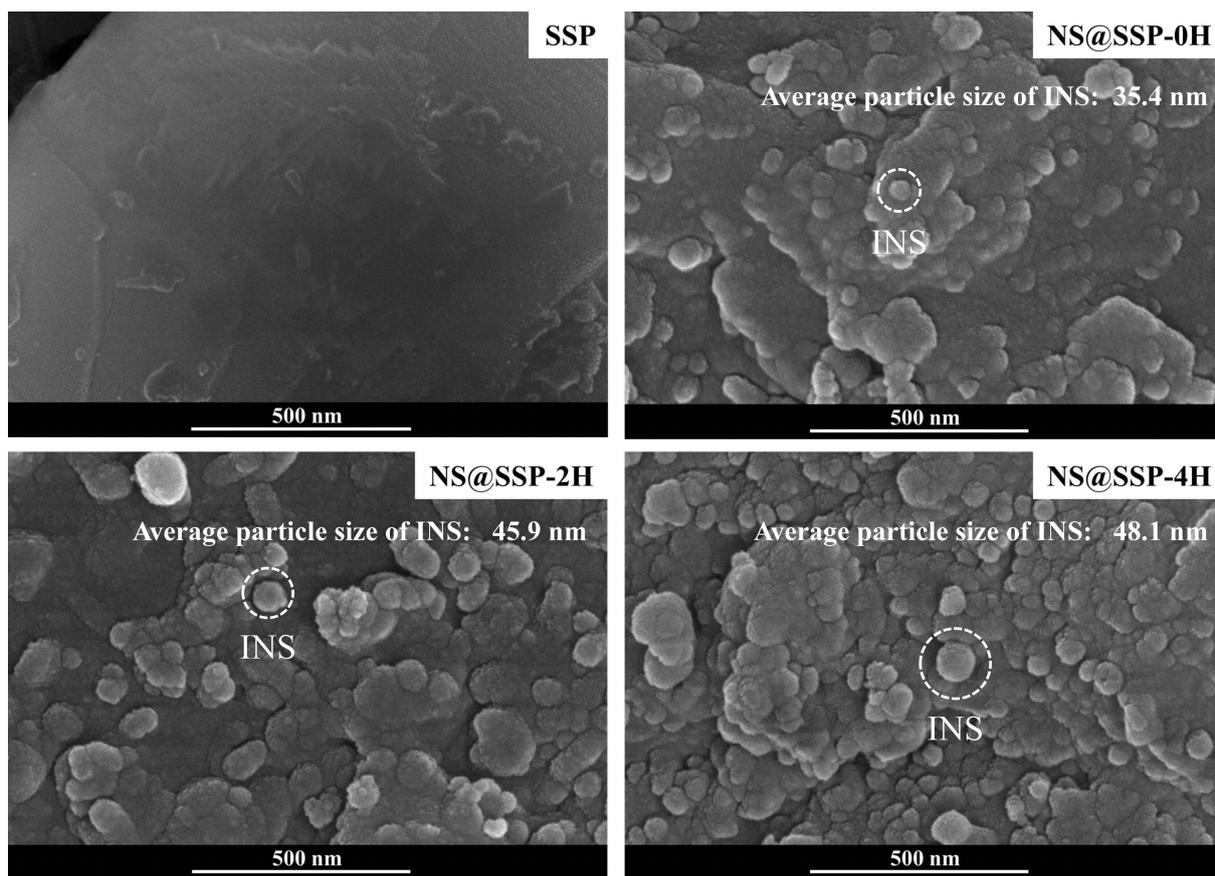


Figure S7: SEM images of NS@SSP synthesized at different reaction times.

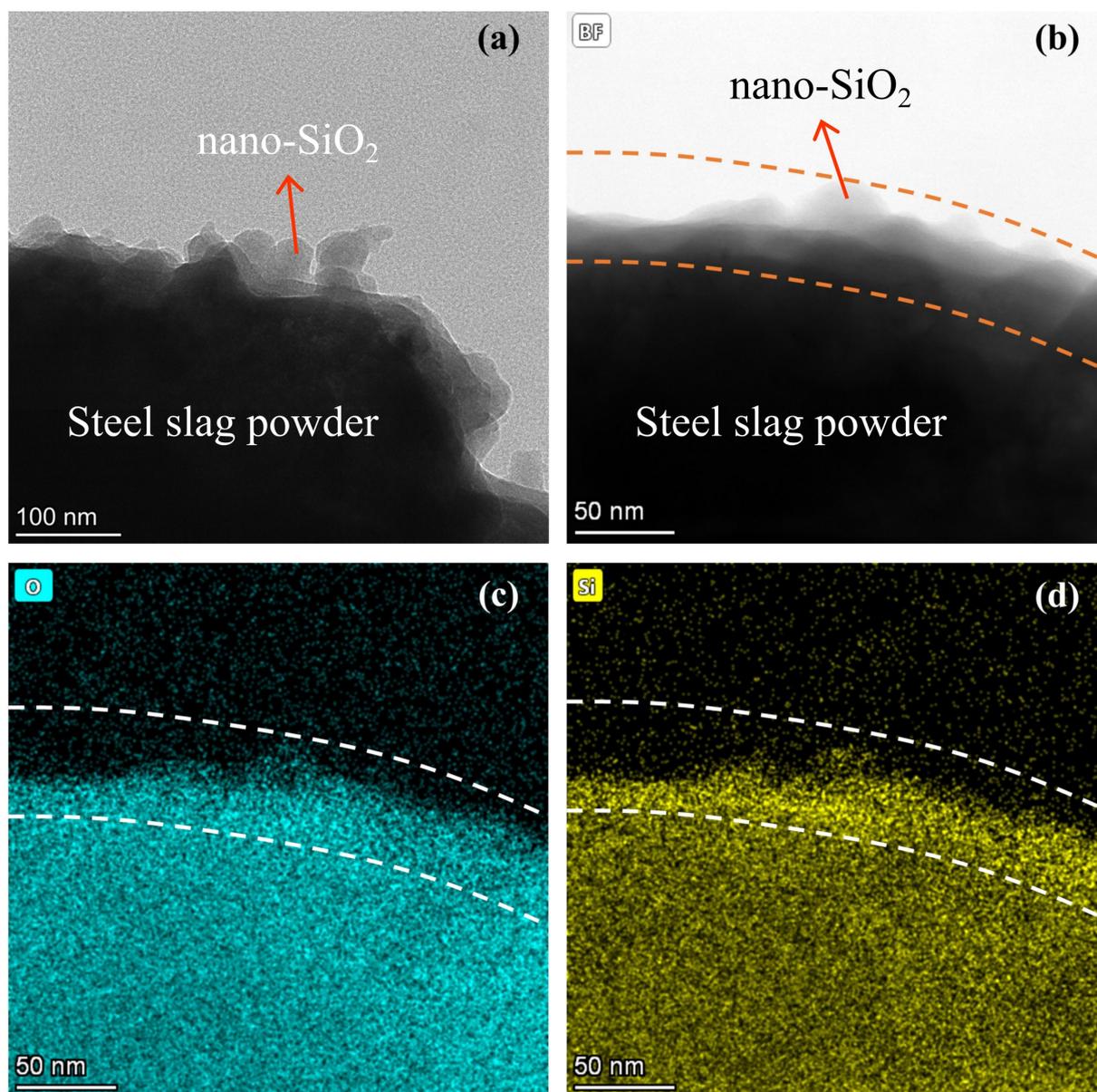


Figure S8: (a) and (b): TEM images of NS@SSP; (c) and (d): EDS images of (b).

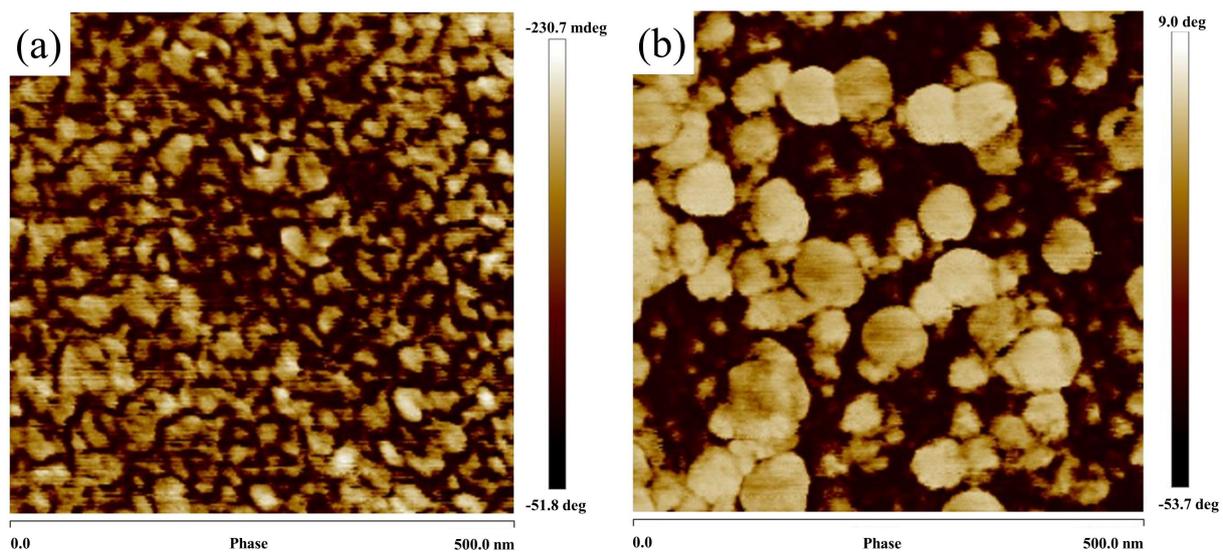


Figure S9: AFM phase: (a) SSP; (b) NS@SSP.

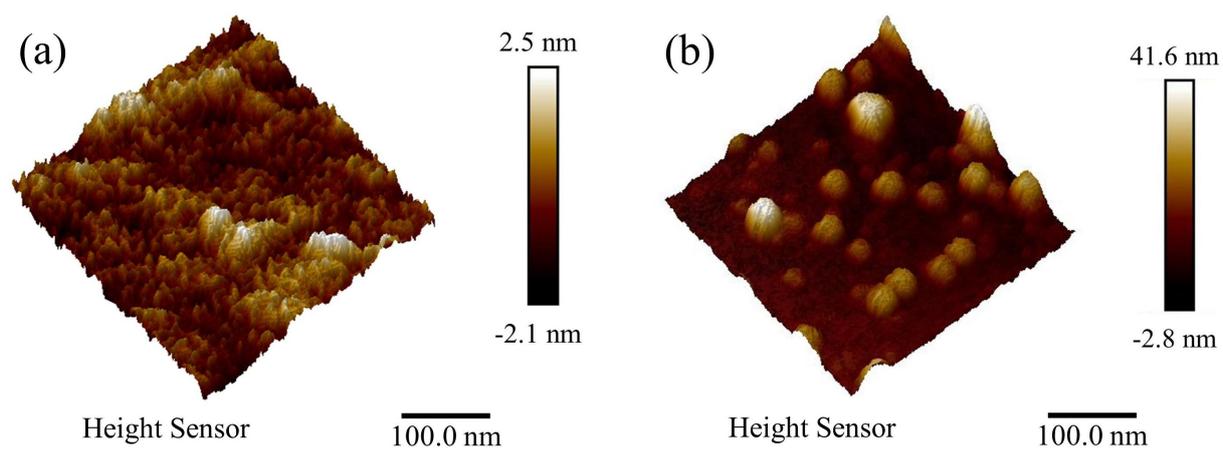


Figure S10: AFM height: (a) SSP; (b) NS@SSP.

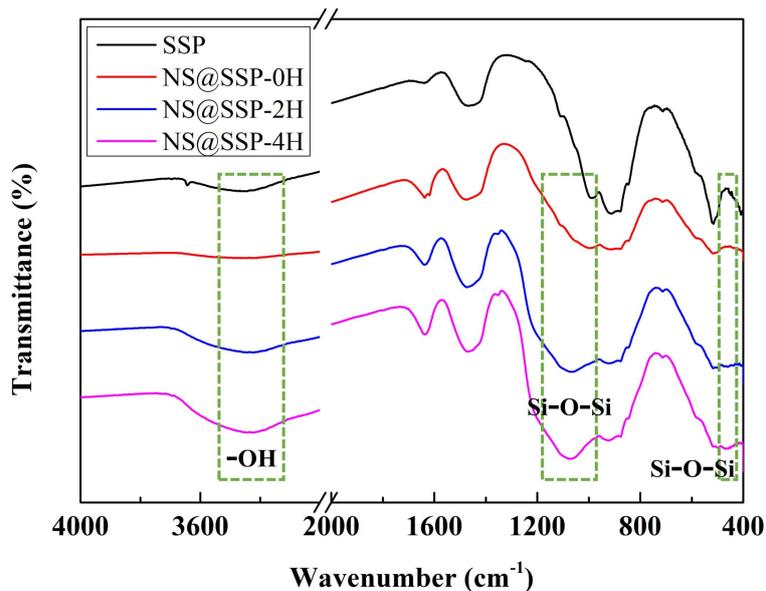


Figure S11: FT-IR patterns of NS@SSP synthesized at different reaction times.

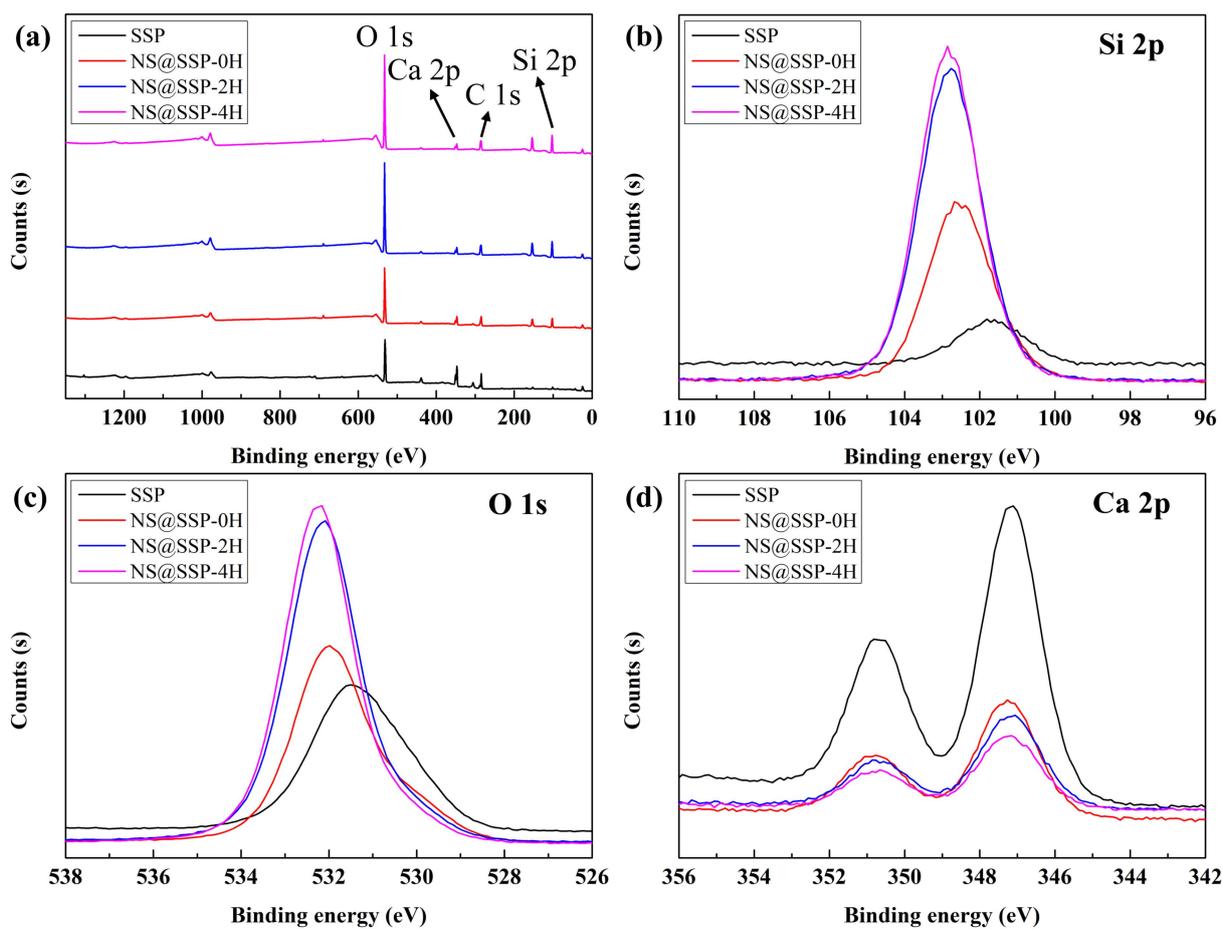


Figure S12: XPS spectra of NS@SSP synthesized at different reaction times:

(a): Survey spectrum; (b) Si 2p spectrum; (c): O 1s spectrum; (d): Ca 2p spectrum.

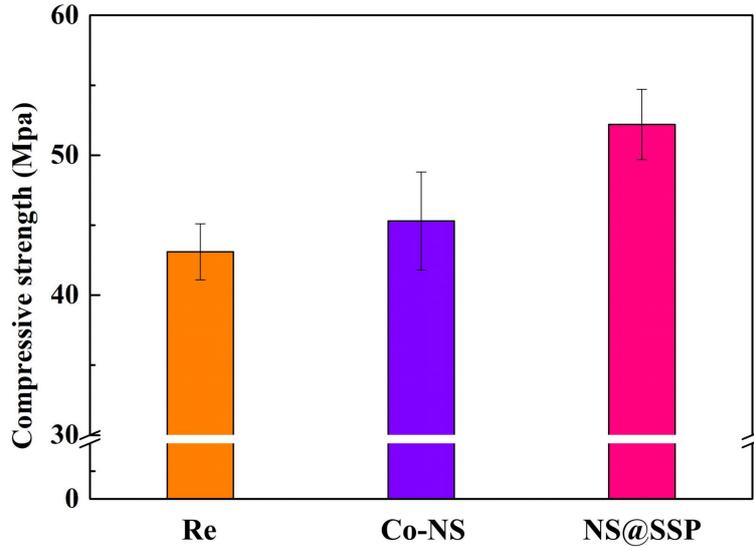


Figure S13: Compressive strength of cement pastes (3d).

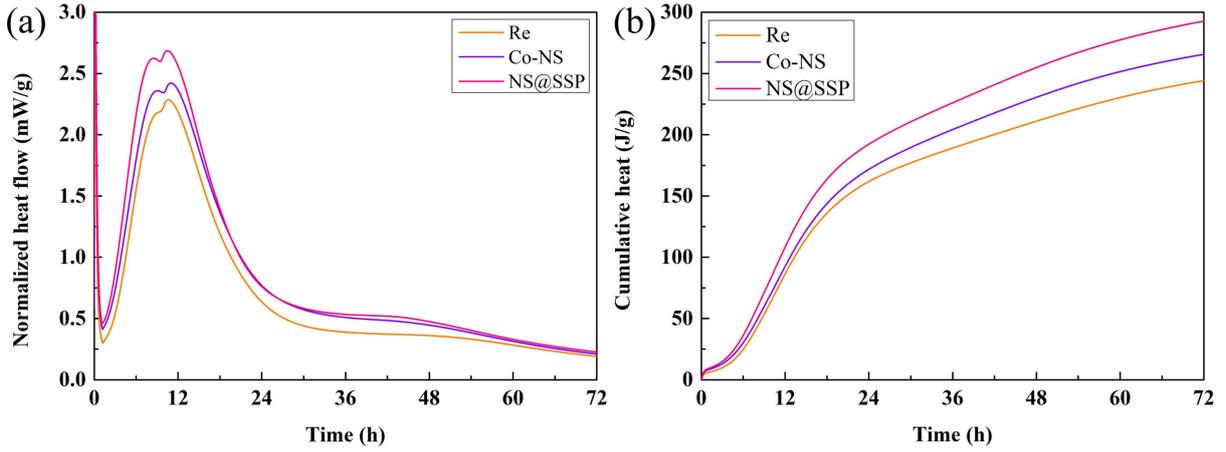


Figure S14: (a) Hydration heat release rate and (b) Cumulative hydration heat of cement pastes.

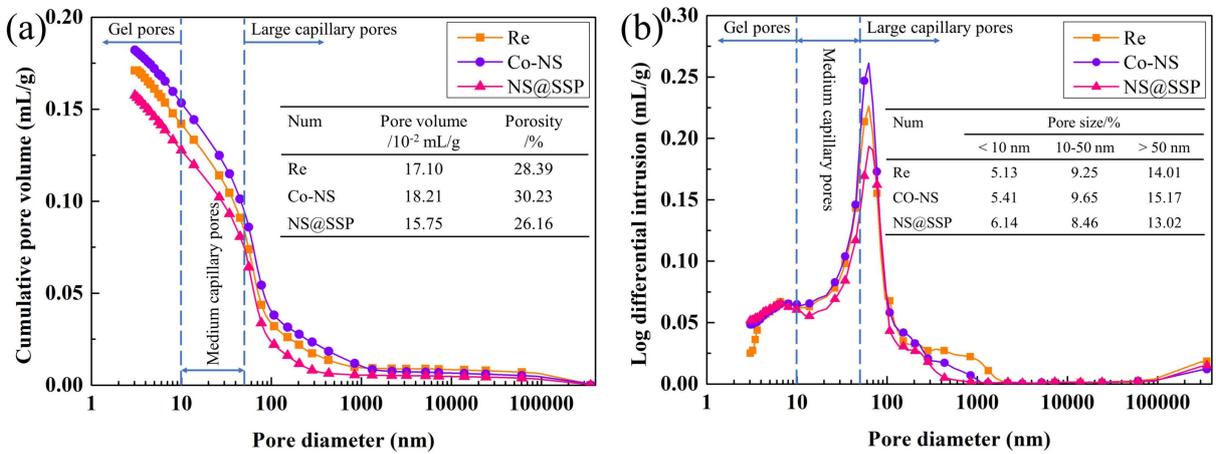


Figure S15: (a) Pore size distribution and (b) Cumulative intrusion of cement pastes (3d).

Table S1: Mix proportions of cement pastes

Cement paste	Cement/g	SSP/g	NS/g	NS@SSP/g	Water/g
Re	411.11	38.89	0	0	180
Co-NS	411.11	38.89	4.50	0	180
NS@SSP	411.11	0	0	43.39	180

Note: (1) The INS loading of NS@SSP is 10.37 wt.%; (2) NS used to prepare Co-NS paste is commercial NS.