

Electronic Supporting information

Development of microencapsulated Al-Si phase change material with high-temperature thermal stability and 3000 cycles durability

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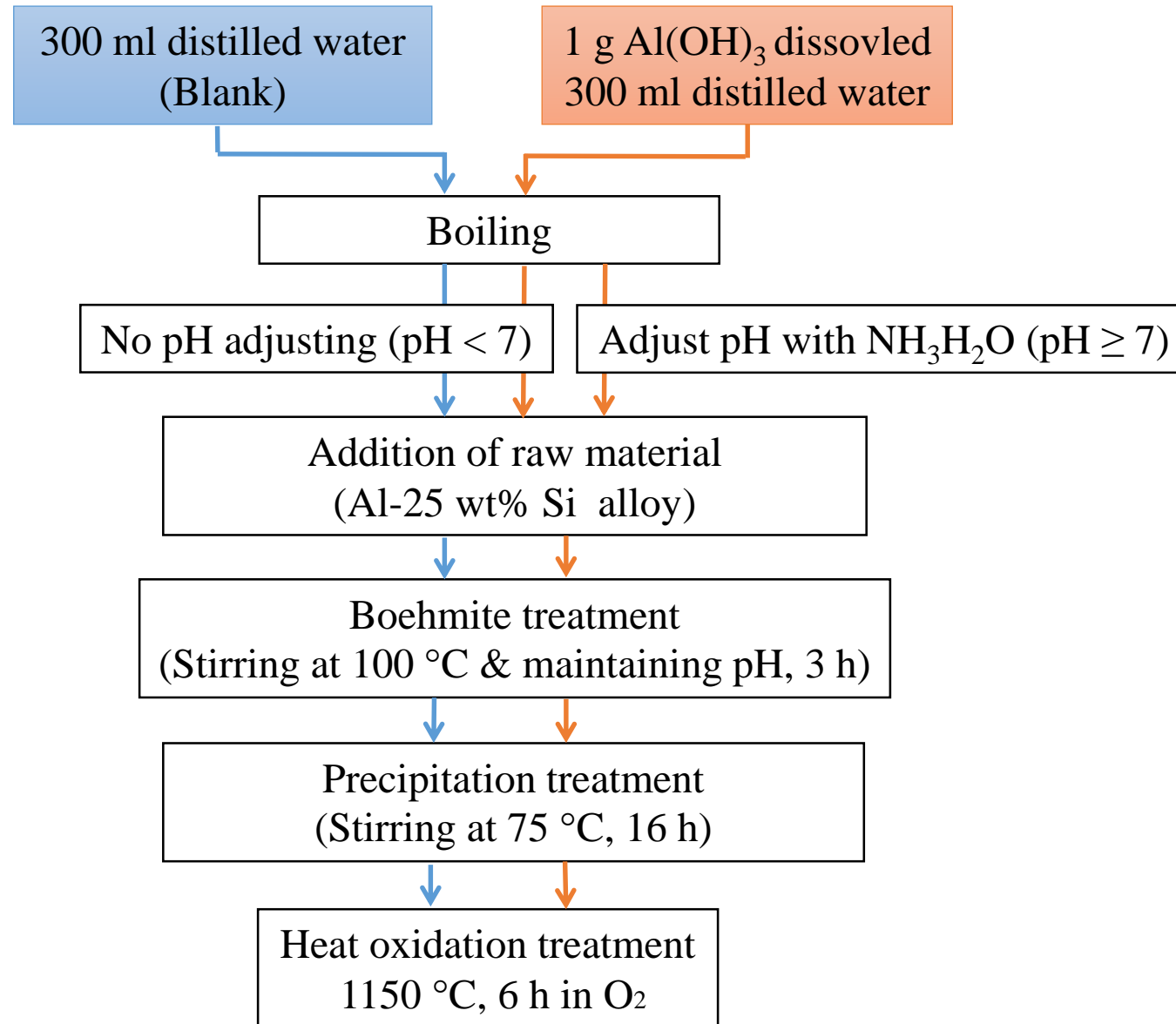


Figure S1. Procedures for the preparation of Al-Si/Al₂O₃ core/shell MEPCM particles.

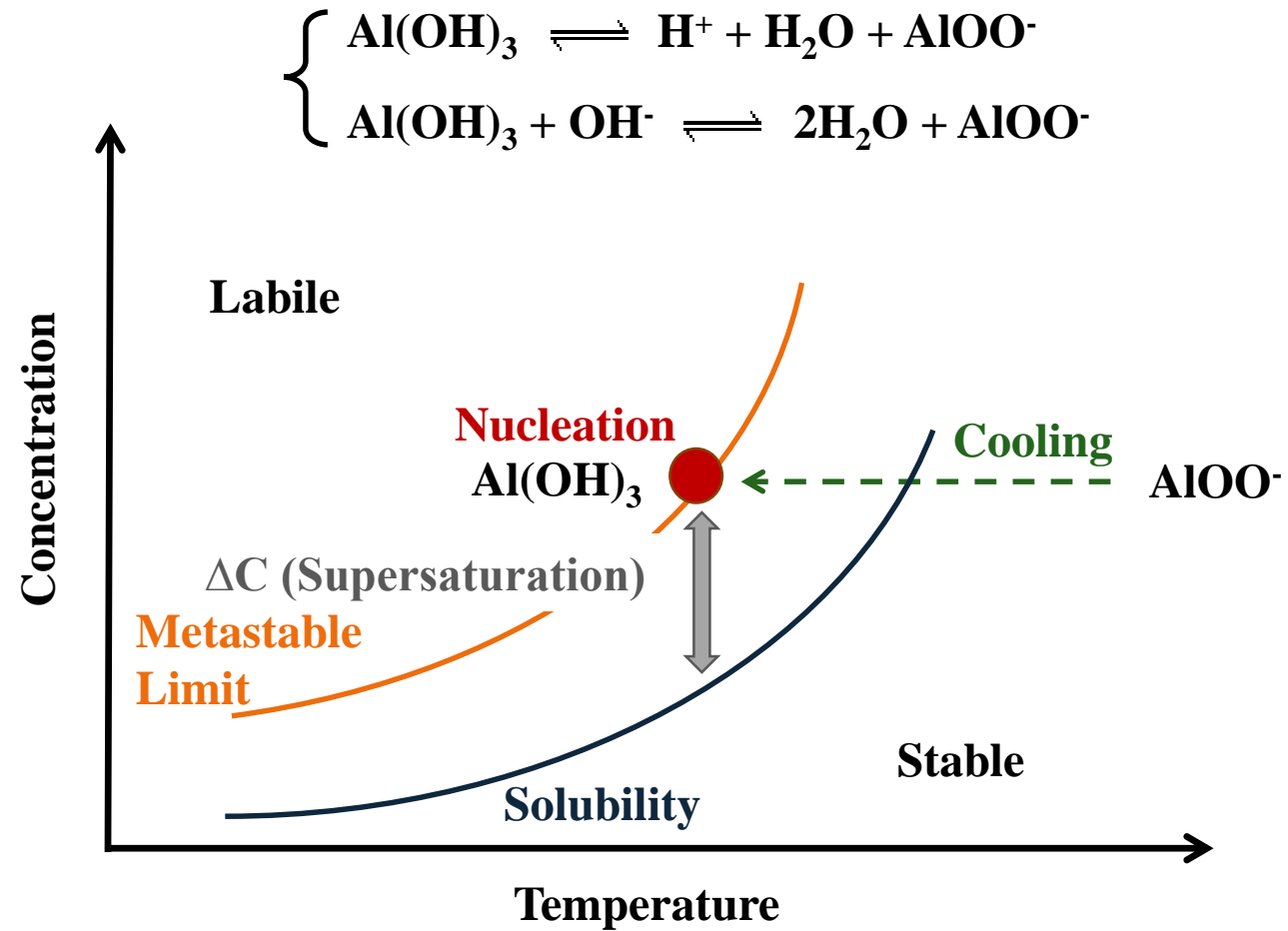


Figure S2. Typical solubility plot

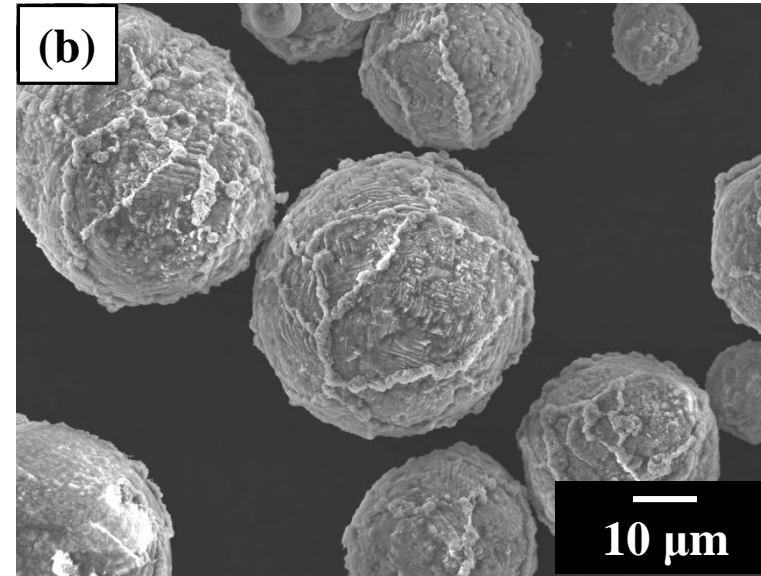
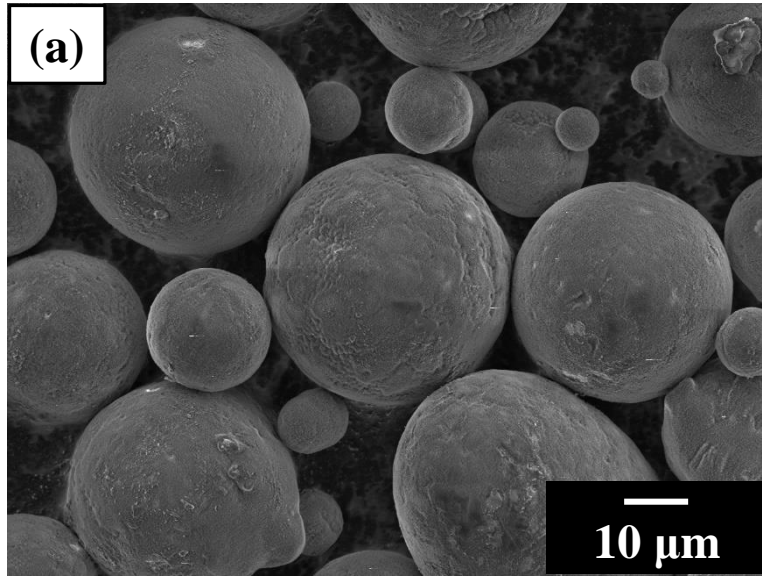


Figure S3. SEM views of Al-25 wt.% Si (a) after 3 h of boehmite treatment, and (b) after 3 h of boehmite treatment followed by 6 h of heat oxidation at 1150 °C.

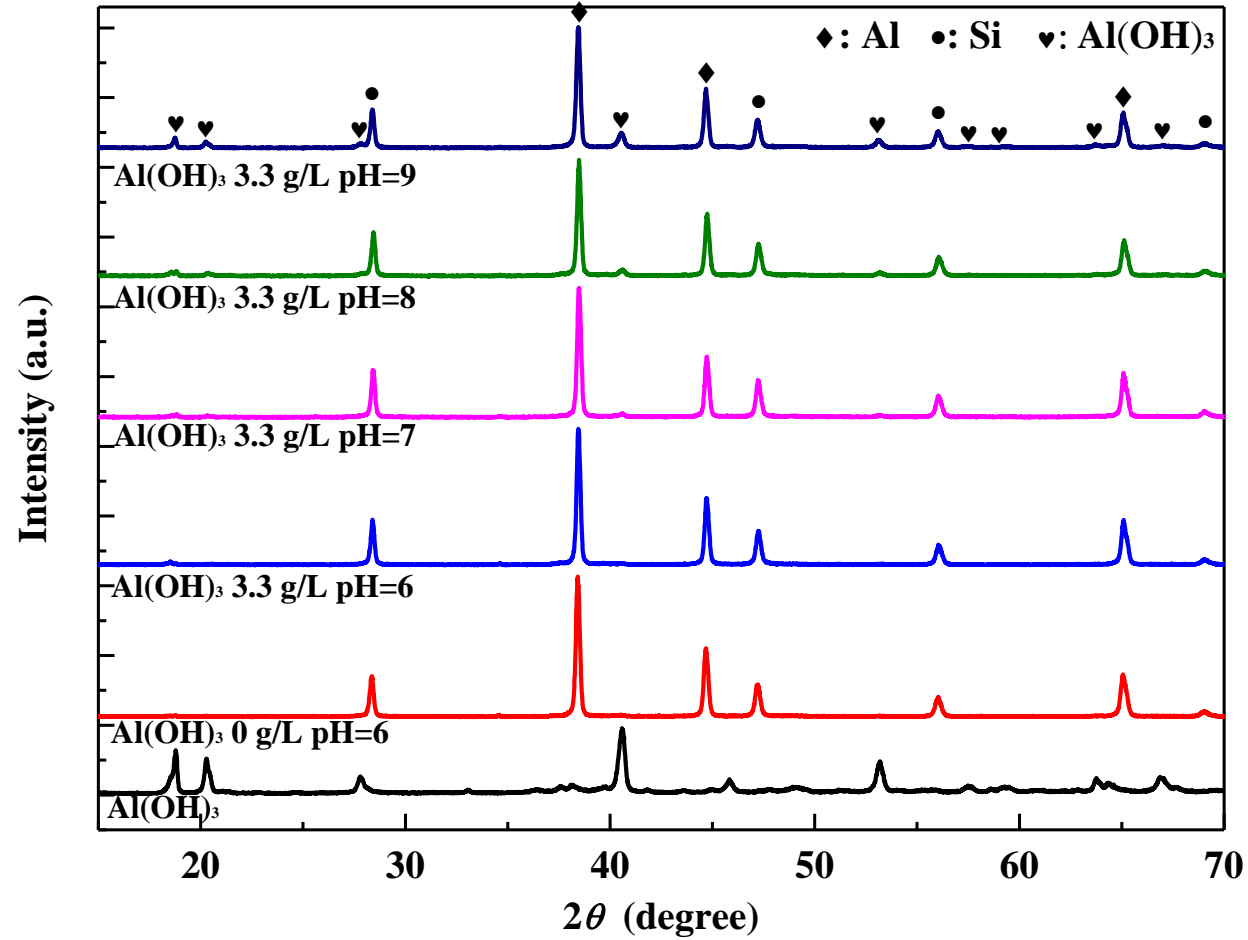


Figure S4. XRD patterns of PCM particles after boehmite and precipitation treatment. The sample of raw $\text{Al}(\text{OH})_3$ is also shown as a comparison.

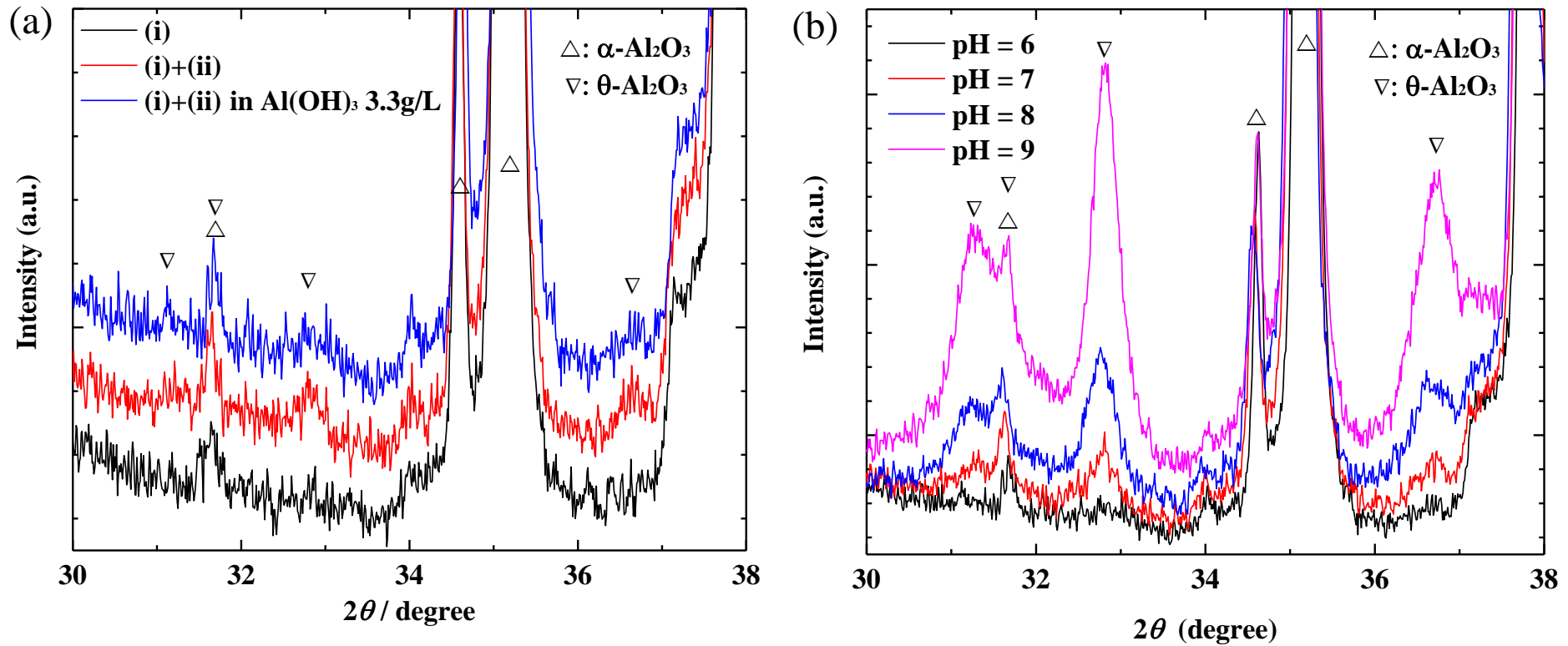


Figure S5. Enlarged XRD spectra from Figure 3. (a) the final samples obtained after heat-oxidation, which were previously subjected to only boehmite treatments (i), boehmite and precipitation treatments without Al(OH)₃-addition, (i+ii) boehmite and precipitation treatments with Al(OH)₃-addition with pH value of 6. (b) The final samples obtained after heat-oxidation, which were previously subjected to both boehmite and precipitation treatments as-conducted with Al(OH)₃-added solutions with different pH values;

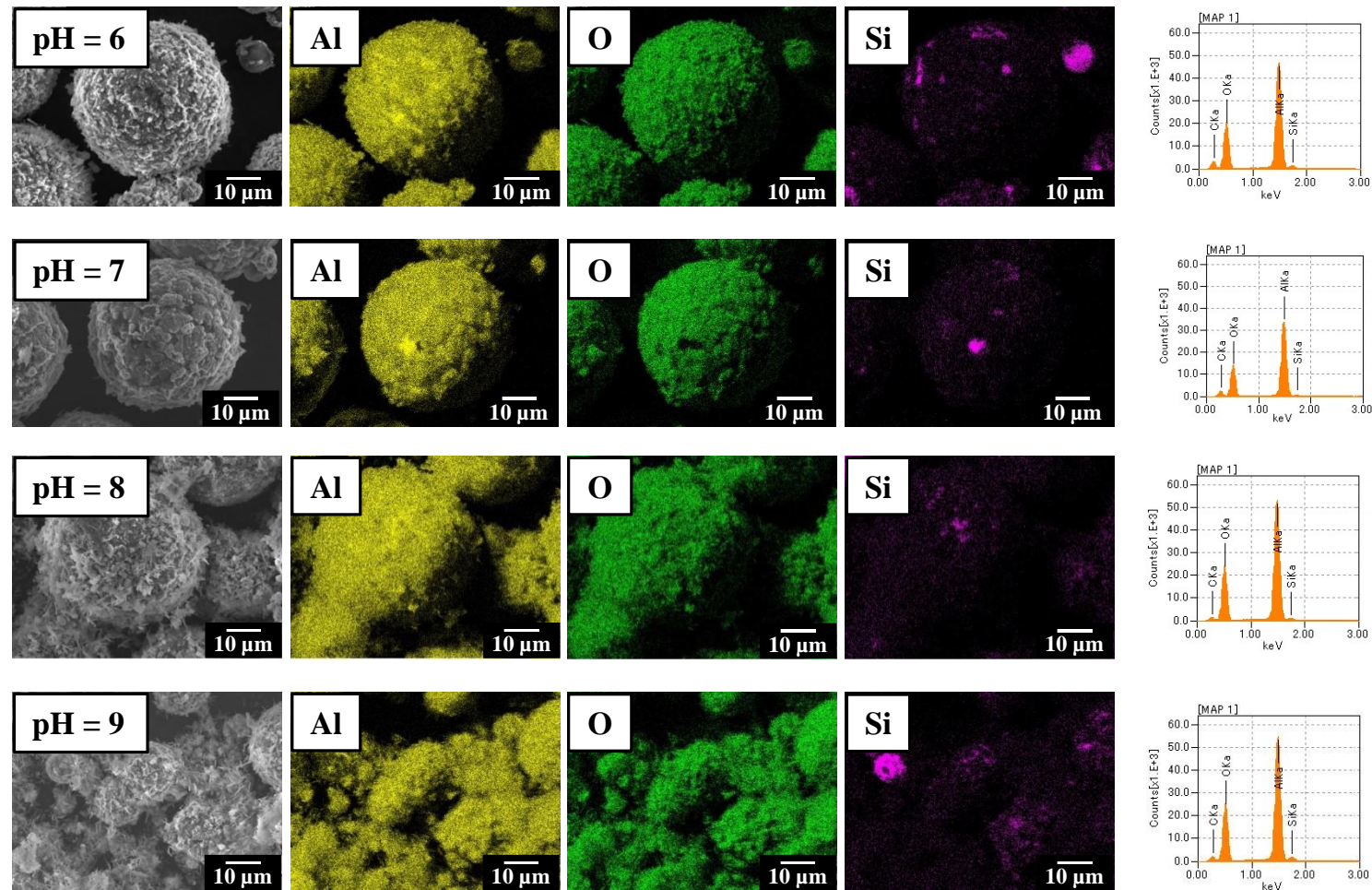


Figure S6. EDS elemental mapping and spectra of MEPCMs after 100 melting-solidification cycles. The samples were subjected to a boehmite treatment during their synthesis process at pH 6, 7, 8, and 9, respectively.

Table S1. Latent heat and phase change temperature of PCM calculated from DSC curves.

	pH	L (J·g ⁻¹)					T _m (°C)			
Raw Material*1	--	432					577			
MEPCM*2	6	257					578			
		1150 °C 6h	100 cycles	1000 cycles	3000 cycles		1150 °C 6h	100 cycles	1000 cycles	3000 cycles
Al(OH)₃ 0 g/ L	6	246	257	--	--		578	579	--	--
Al(OH)₃ 3.3 g/ L	6	251	243	--	--		578	578	--	--
	7	199	198	197	--		578	578	578	--
	8	183	183	183	180		578	577	578	577
	9	181	171	--	--		578	578	--	--

*1: Same as Ref. 46

*2: Condition: 3h boehmite treatment then 1150 °C, 6 h heat-oxidation.

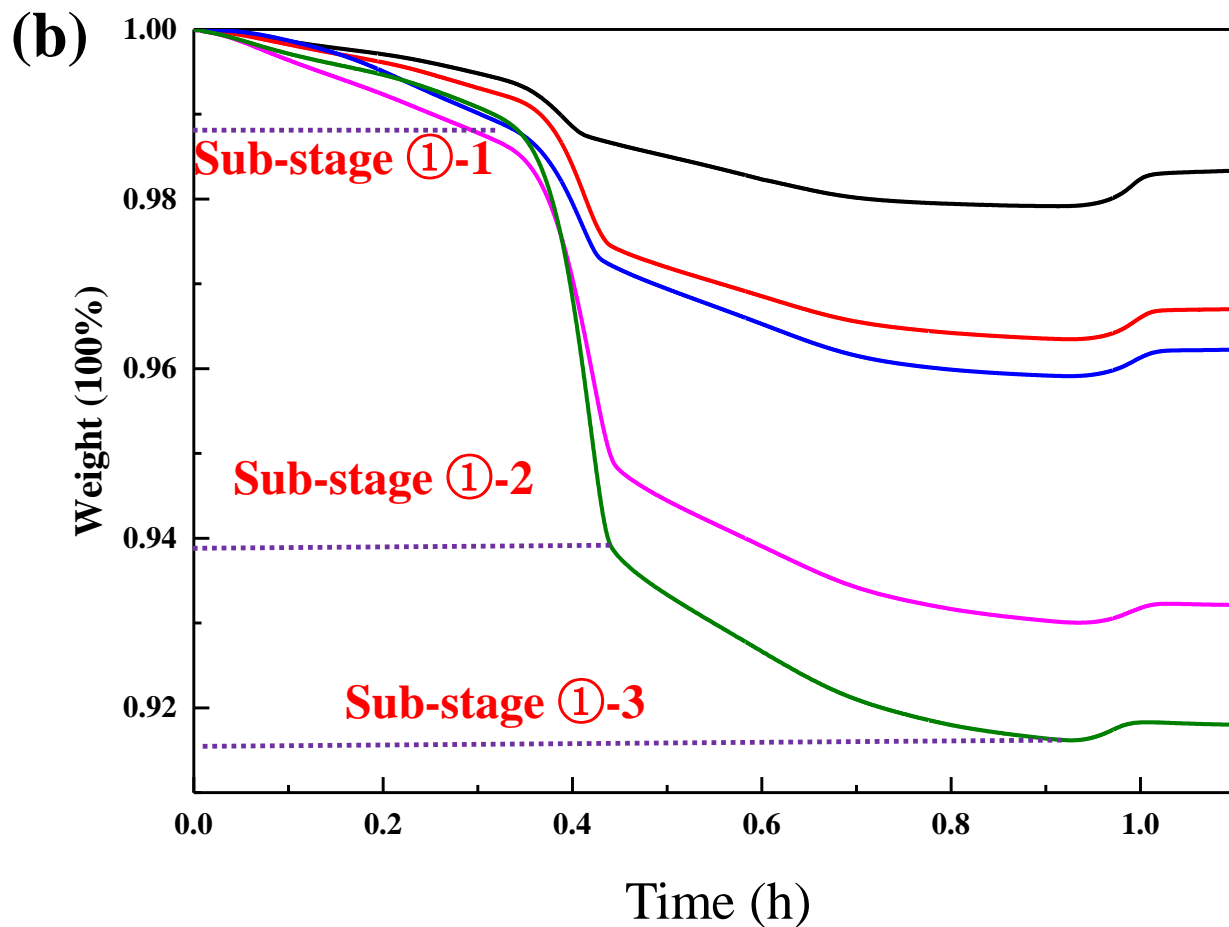
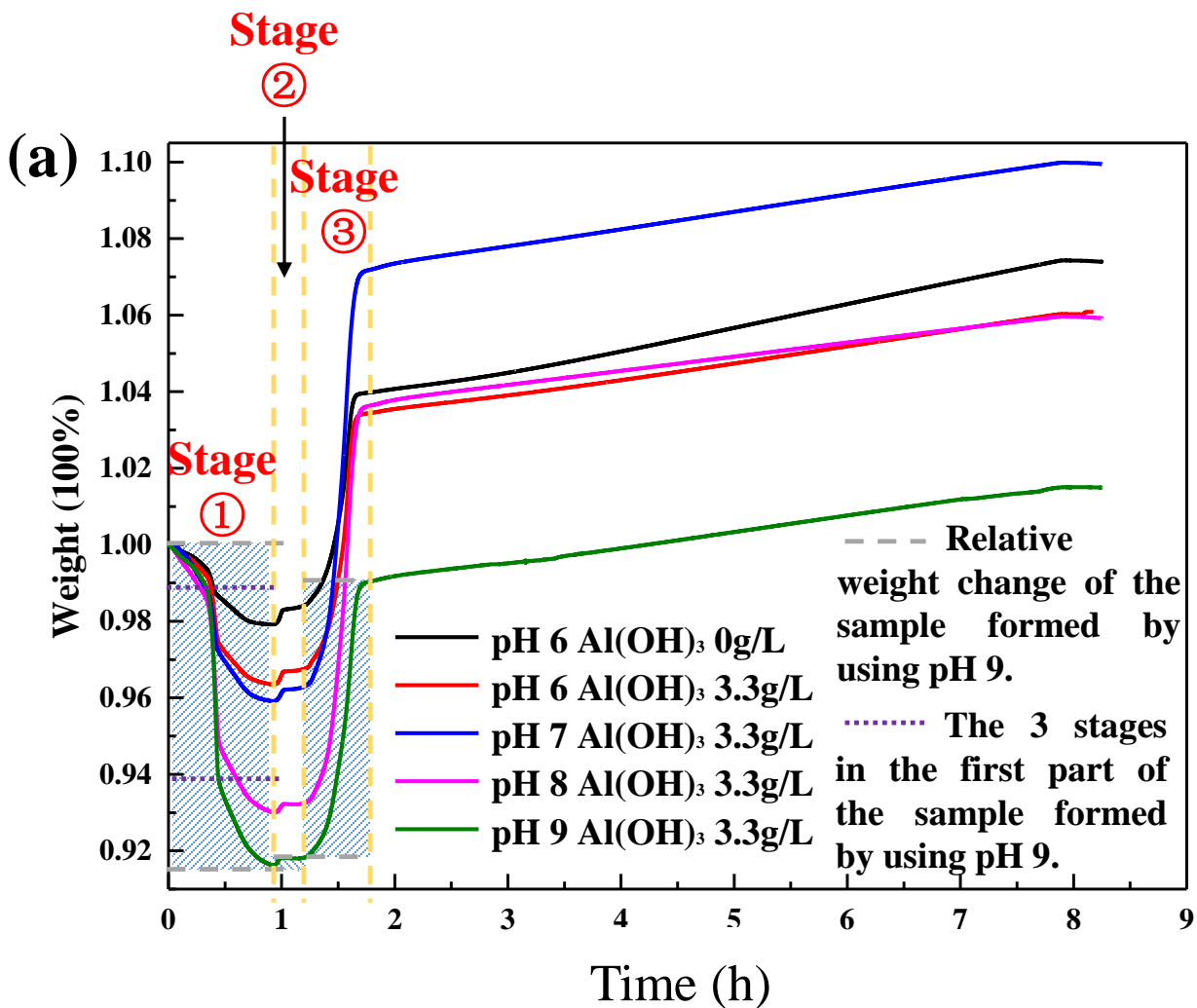


Figure S7. Thermogravimetric (TG) curve during heat-oxidation of the precursor samples obtained with different boehmite treatment (left figure). The right figure is the enlargement of the part from 1 – 4000 s.