

Table S1. LOI and the amount of total alkalis of the cements

	Cement #1	Cement #2	Cement #3	Cement #4
LOI, %	0.72	1.61	0.71	0.79
Total alkalis, %	0.18	0.45	1.61	0.92

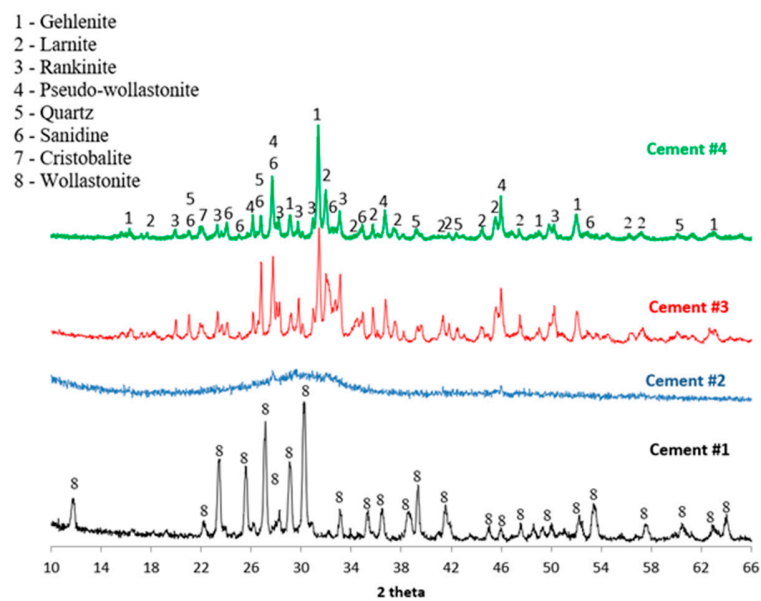


Figure S1. XRD patterns of the cements

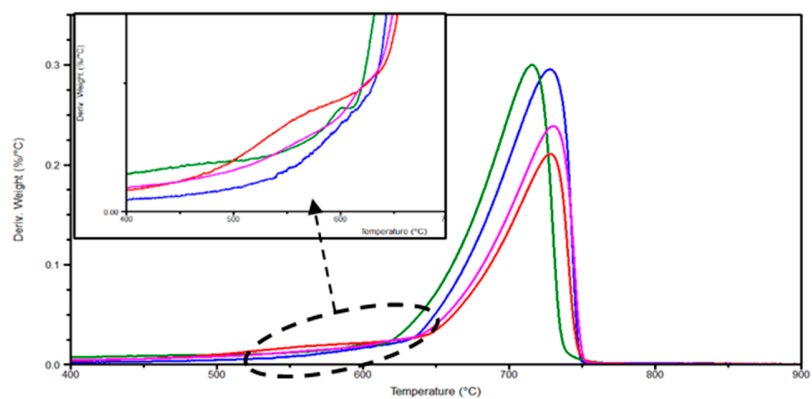


Figure S2. DTGA curves of the carbonated paste samples; left upper corner image contains the magnified view of the hump in the 450-630°C temperature range.

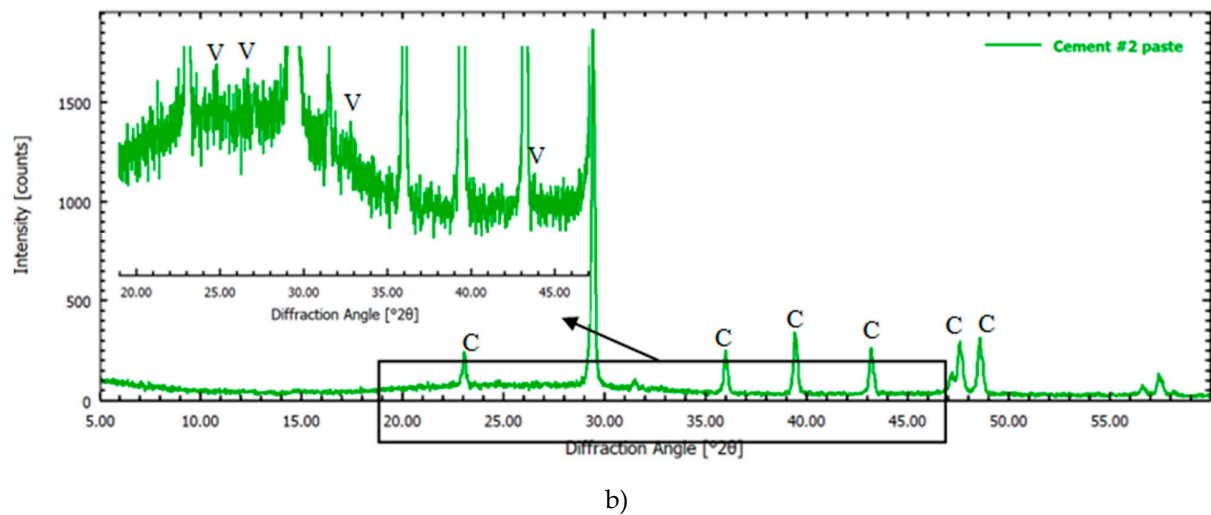
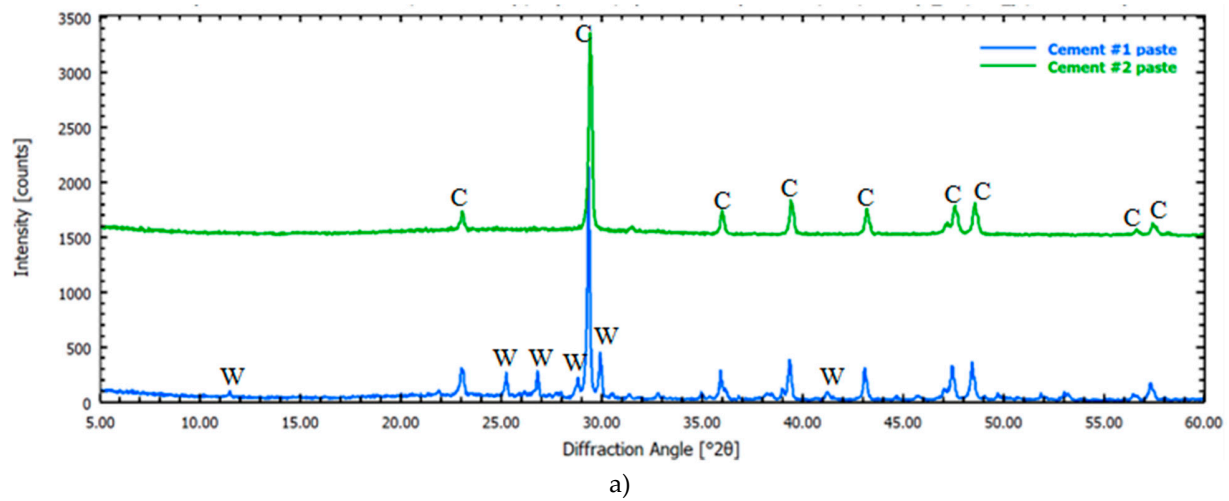


Figure S3. XRD patterns of carbonated cement #1 and #2 pastes: a) both cement pastes with all the main peaks labeled; b) XRD pattern of cement #2 paste with magnified peaks of vaterite (key: C - calcite, V - vaterite, W - wollastonite)

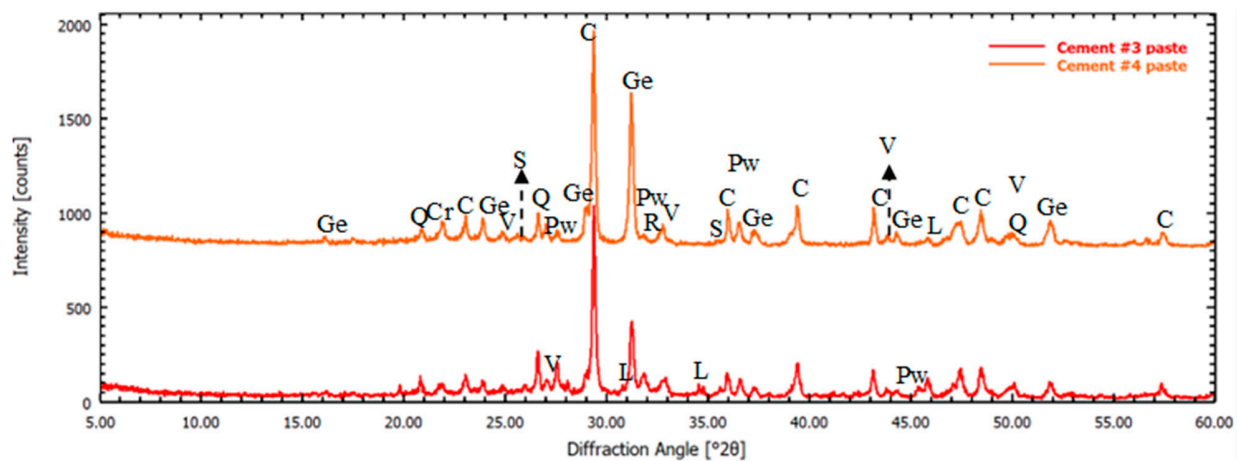
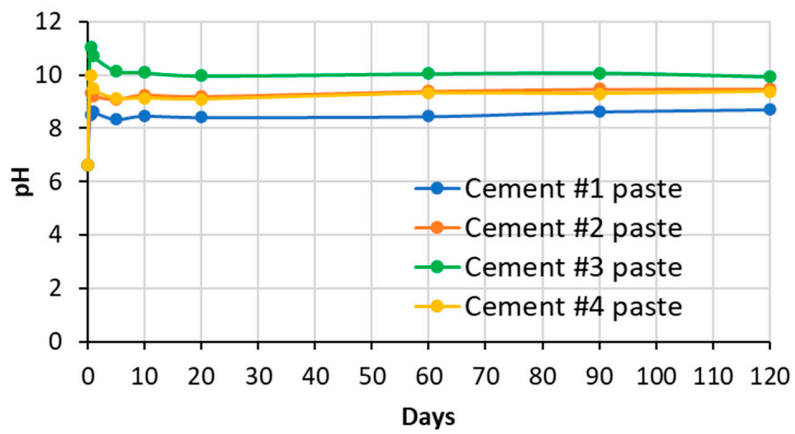
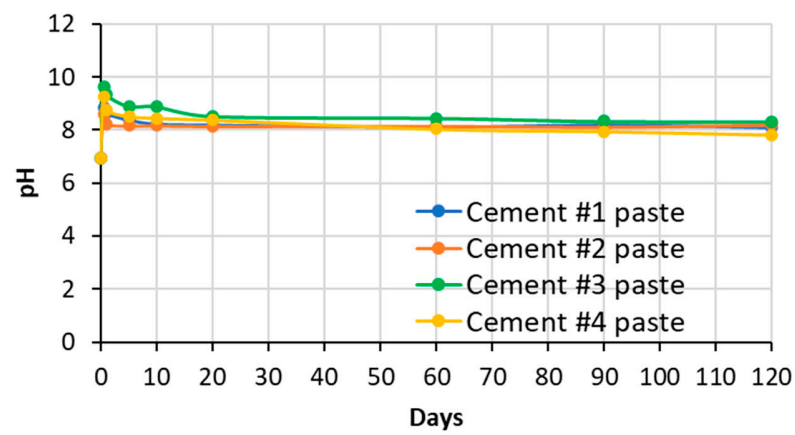


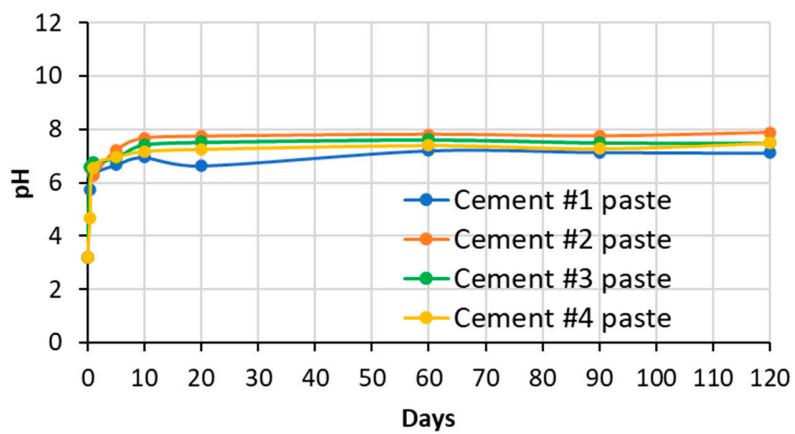
Figure S4. XRD patterns of carbonated cement #3 and #4 pastes (key: C – calcite, Cr – cristobalite, Ge – gehlenite, L – larnite, Pw – pseudo-wollastonite, Q – quartz, R – rankinite, S – sanidine, V – vaterite)



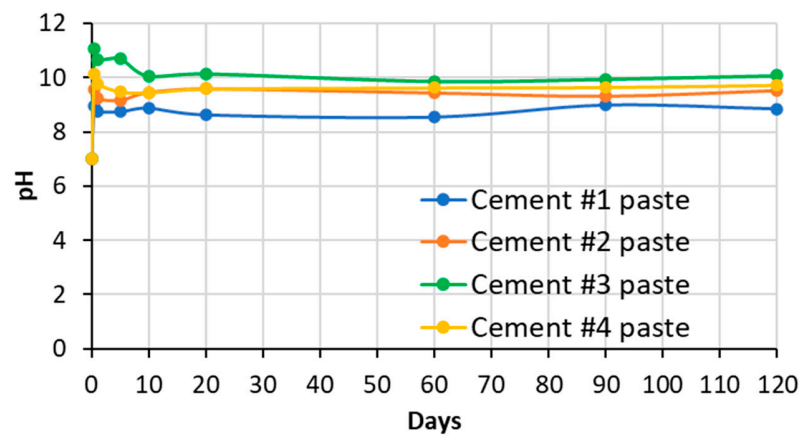
a)



b)



c)



d)

Figure S5. Change of pH values of sulfate solutions a) sodium sulfate, b) magnesium sulfate c) aluminum sulfate solution d) de-ionized water

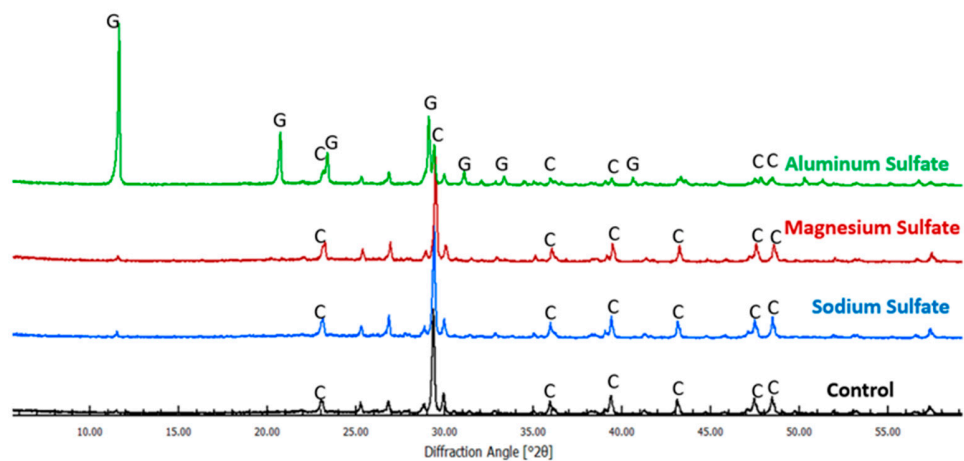


Figure S6. XRD patterns of the cement #1 paste samples after 120-days of exposure to sodium, magnesium and aluminum sulfate solutions (key: C – calcite, G – gypsum)

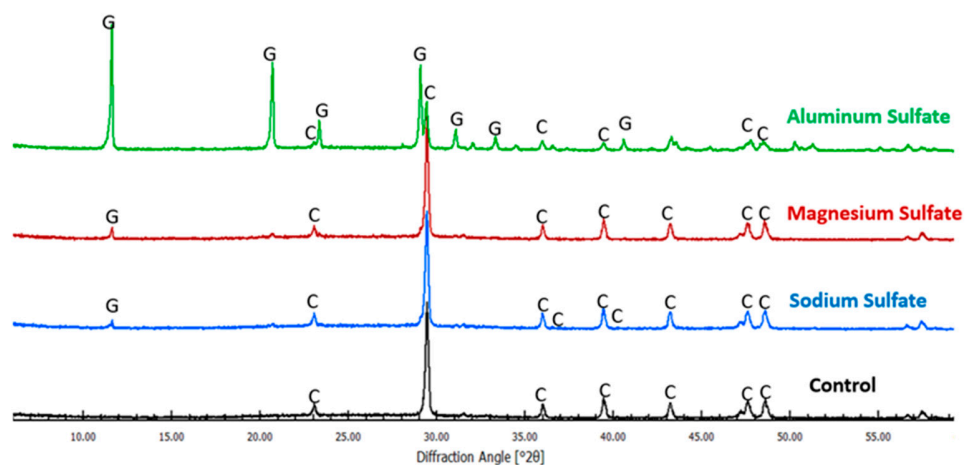


Figure S7. XRD patterns of the cement #2 paste samples after 120-days of exposure to sodium, magnesium and aluminum sulfate solutions (key: C – calcite, G – gypsum)

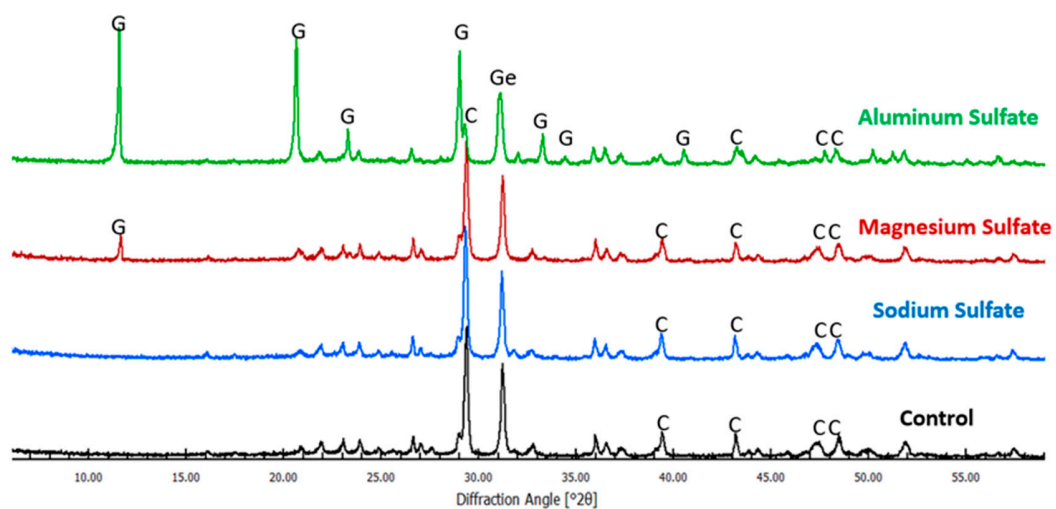
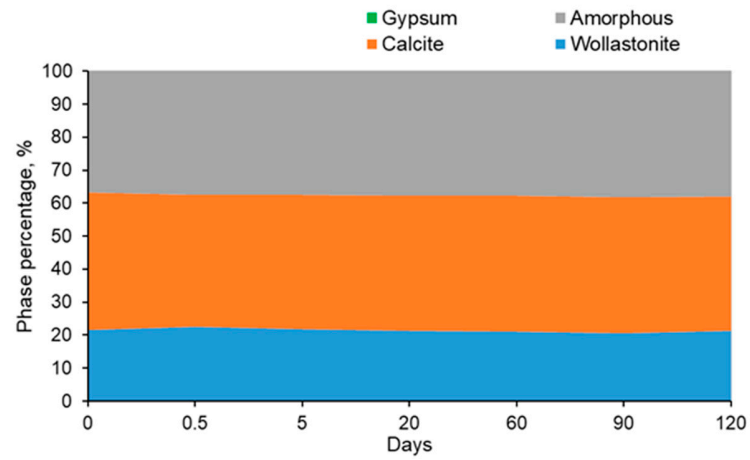
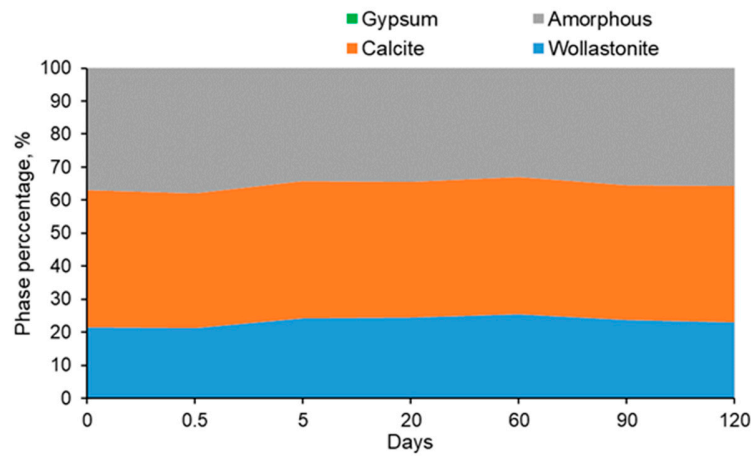


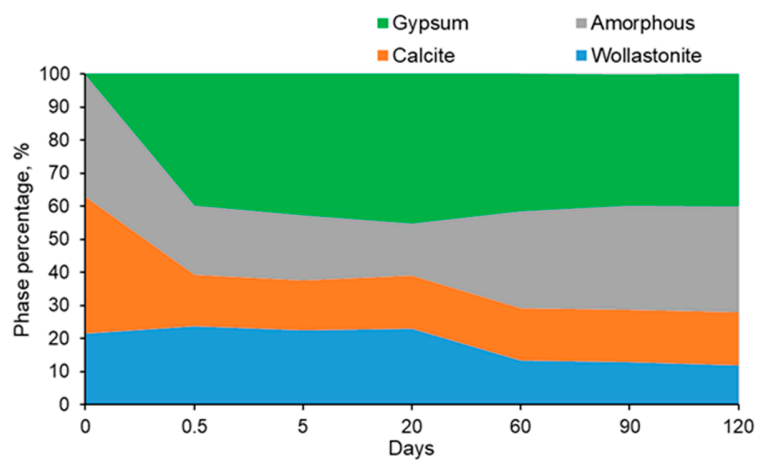
Figure S8. XRD patterns of the cement #4 paste samples after 120-days of exposure to sodium, magnesium and aluminum sulfate solutions (key: C – calcite, G – gypsum)



a) After exposure to sodium sulfate solution

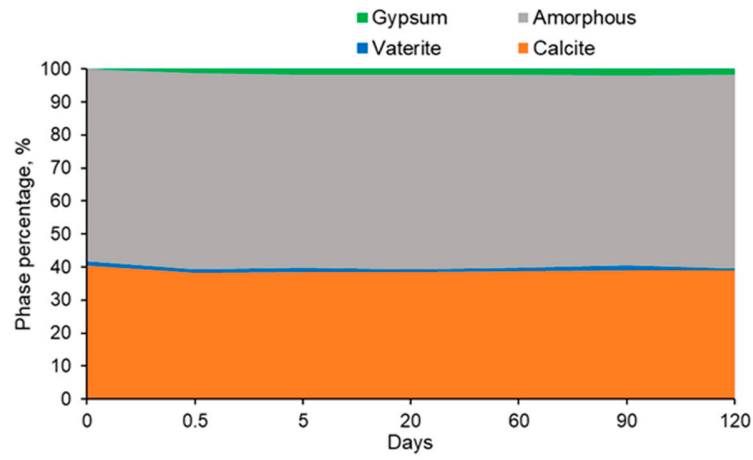


b) After exposure to magnesium sulfate solution

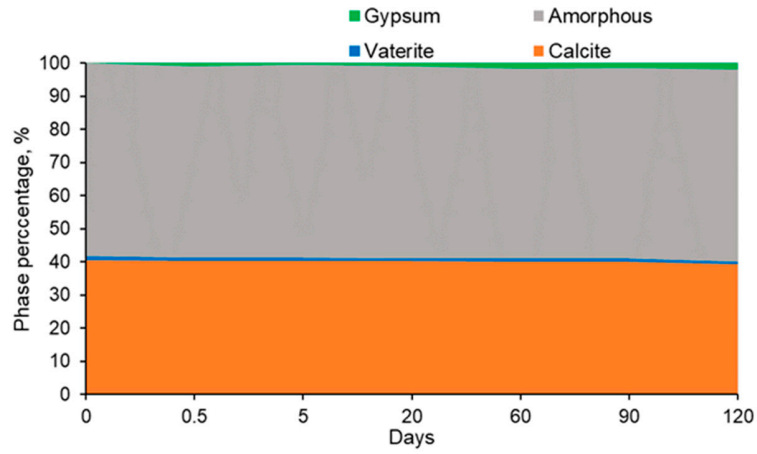


c) After exposure to aluminum sulfate solution

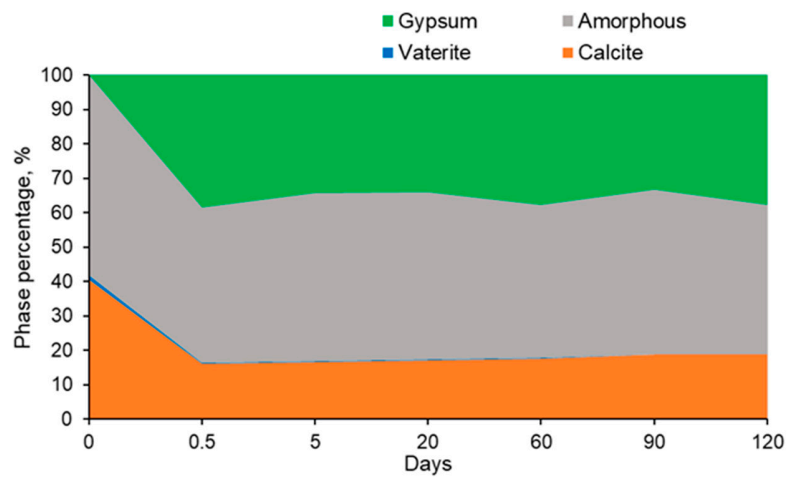
Figure S9. The results of the QXRD analysis of paste samples from cement #1 after sulfate exposure test



a) After exposure to sodium sulfate solution

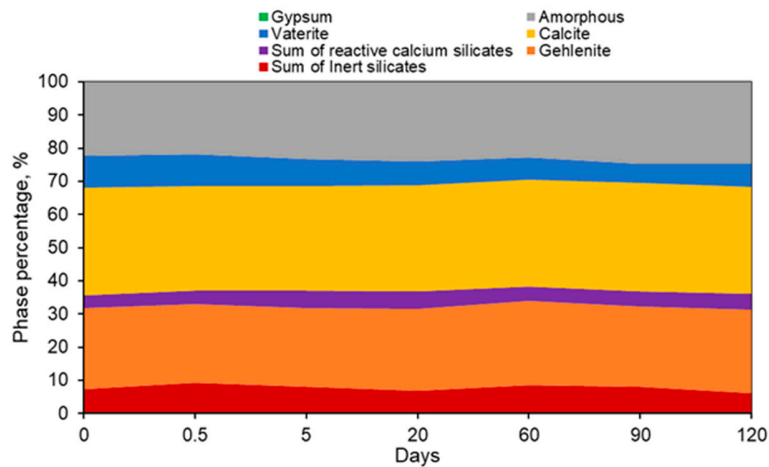


b) After exposure to magnesium sulfate solution

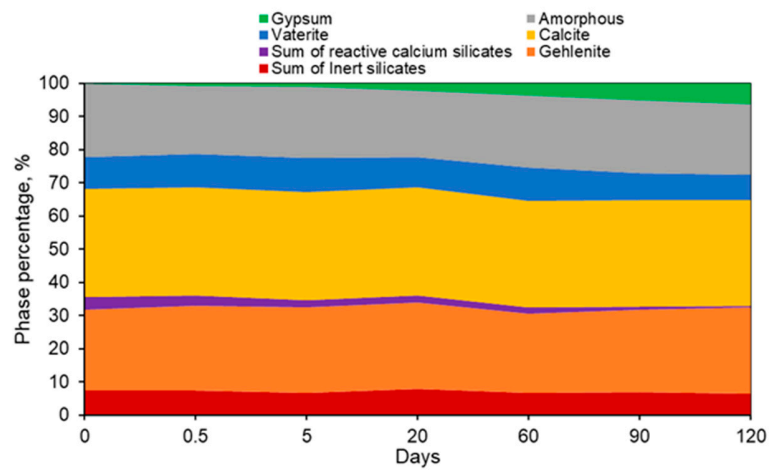


c) After exposure to aluminum sulfate solution

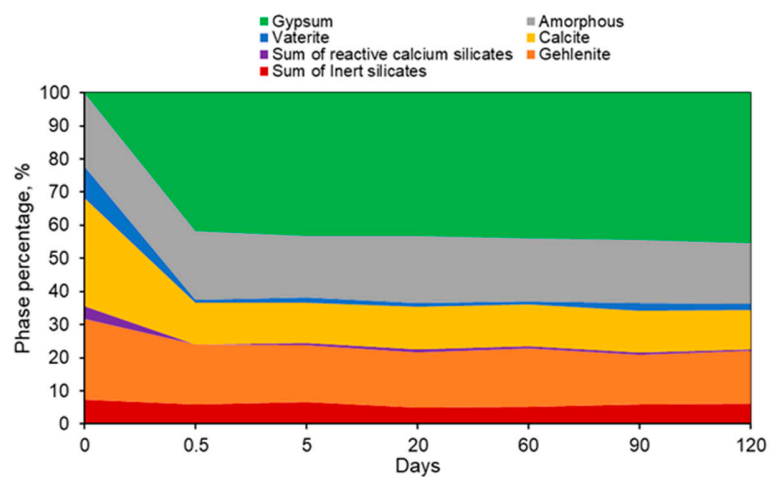
Figure S10. The results of the QXRD analysis of paste samples from cement #2 after sulfate exposure test



a) After exposure to sodium sulfate solution



b) After exposure to magnesium sulfate solution



c) After exposure to aluminum sulfate solution

Figure S11. The results of the QXRD analysis of paste samples from cement #4 after sulfate exposure test

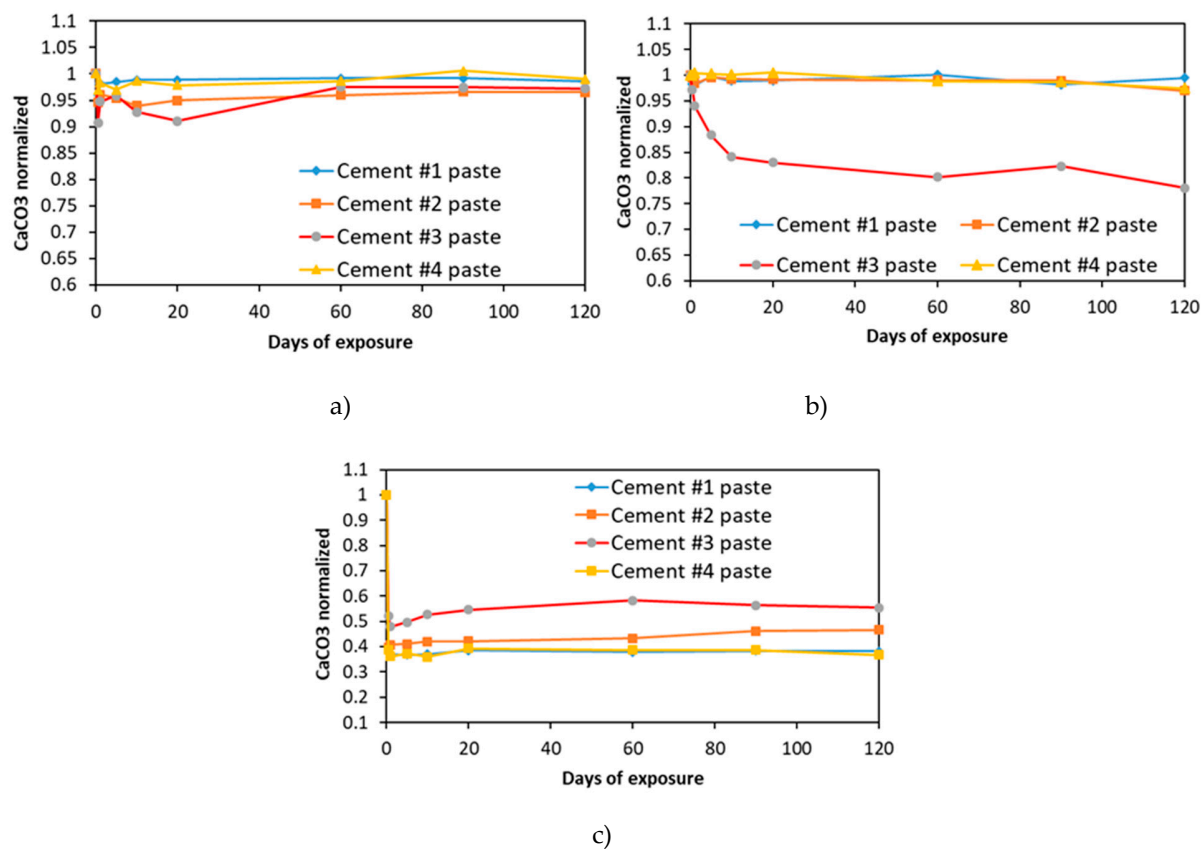
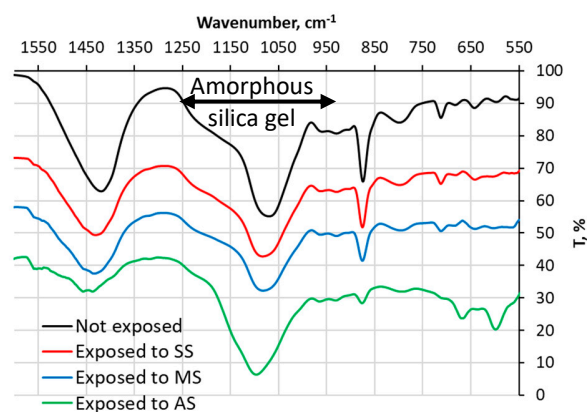
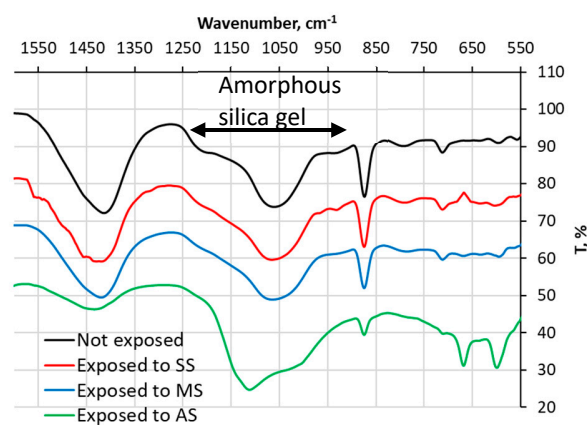


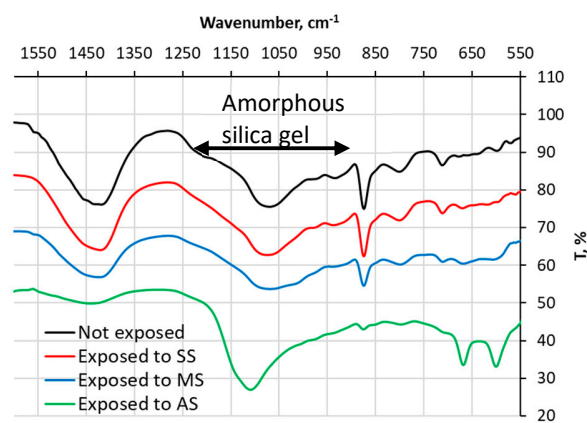
Figure S12. Change of calcium carbonate phase during exposure to a) sodium sulfate, b) magnesium sulfate c) aluminum sulfate solution



a)



b)



c)

Figure S13. FT-IR spectra of the paste samples after 120-day exposure to the sulfate solutions: (a) – cement #1 paste, (b) – cement #2 and (c) – cement #4 paste samples. Key: SS – sodium sulfate, MS – magnesium sulfate, AS – aluminum sulfate