Table S1. Phase composition of the carbonated samples (chloride rich brine, 333 K, 2 MPa), determined by powder X-ray diffraction (PXRD) and Rietveld refinement [24] (R_{wp}: ~9 %).

Reaction time [h]	Gas composition	Wollastonite [wt.%]	Calcite [wt.%]	Aragonite [wt.%]	Amorphous [wt.%]	Halite [wt.%]
24*	CO_2*	2.7 ± 0.1*	28.1 ± 1.0*	23.8 ± 0.6*	45.7 ± 2.2*	---*
24	CO_2	6.3 ± 1.6	60.5 ± 0.4	1.0 ± 0.3	32.2 ± 1.9	0.4 ± 0.3
3	CO_2 + SO_2 + NO_2	74.0 ± 1.6	18.8 ± 1.9	0.8 ± 0.4	9.2 ± 1.0	0.4 ± 0.2
6	CO_2 + SO_2 + NO_2	55.5 ± 5.4	34.6 ± 3.6	0.6 ± 0.2	13.1 ± 3.5	1.0 ± 0.1
12	CO_2 + SO_2 + NO_2	28.0 ± 1.1	46.8 ± 1.5	0.7 ± 0.3	23.9 ± 2.2	0.7 ± 0.2
18	CO_2 + SO_2 + NO_2	16.9 ± 0.9	53.3 ± 0.3	0.4 ± 0.1	29.0 ± 1.3	0.4 ± 0.2
24	CO_2 + SO_2 + NO_2	6.7 ± 0.7	57.7 ± 0.3	0.7 ± 0.2	34.5 ± 0.8	0.5 ± 0.2

* The carbonation took place with pure water as carbonation medium. This experiment functioned as a reference.