

Supplementary Material

X-ray fluorescence analysis (XRF)

The major elements were quantified in duplicate from the materials < 500 μm by X-ray fluorescence analysis (XRF) (Philips MagiX PRO spectrometer, PANalytical B.V. Almedo, Netherlands) equipped with a rhodium X-ray tube (3.2 kW) using air-dry powder samples fused with $\text{Li}_2\text{B}_4\text{O}_7$ (mixing ratio 1:7). The loss on ignition was determined separately at 1000 $^\circ\text{C}$.

Table S1. Chemical composition of Secursol UHP.

Weight percent oxide (%)														
SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MgO	CaO	Na ₂ O	K ₂ O	TiO ₂	MnO	P ₂ O ₅	SO ₃	Cr ₂ O ₃	NiO	LOI	SUM
47.45	13.67	9.74	3.10	2.06	0.01	0.68	2.33	0.19	0.36	0.01	0.02	0.01	20.30	99.94

Simultaneous Thermal Analysis (STA)

STA was performed on a STA 449 C Jupiter (NETZSCH-Gerätebau GmbH) equipped with a thermogravimetry/differential scanning calorimetry (TG/DSC) sample holder. Thereby, about 100 mg were filled into Pt/Rh crucibles (diameter 5 mm and height 5 mm) with a punched lid and an empty crucible with lid served as reference. Samples were heated with 10 K/min from 35 to 1100 $^\circ\text{C}$ in synthetic air (SA, 50 mL min^{-1}) / N₂ (20 mL min^{-1}) or in N₂ only, (50/20 mL min^{-1}).

The STA is connected to a quadrupole mass spectrometer 403 C Aëolos (InProcess Instruments (IPI)/NETZSCH-Gerätebau GmbH) by a heated quartz glass capillary. Evolved H₂O ($m/z=18$), CO₂ ($m/z=44$) and SO₂ ($m/z=64$) were detected by mass spectrometer (MS).

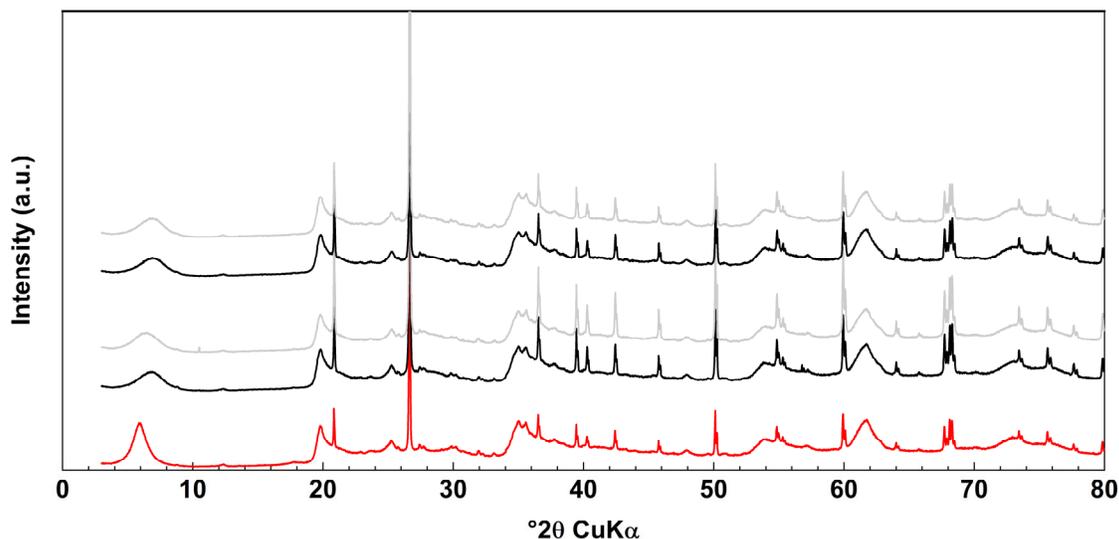


Figure S1. XRD pattern of powdered DS samples. Red: raw Secursol UHP, black: DS1 and grey DS2 cell 9 (middle) and cell 10 (top). Quartz intensity at 26 $^\circ 2\theta$ has been cropped.

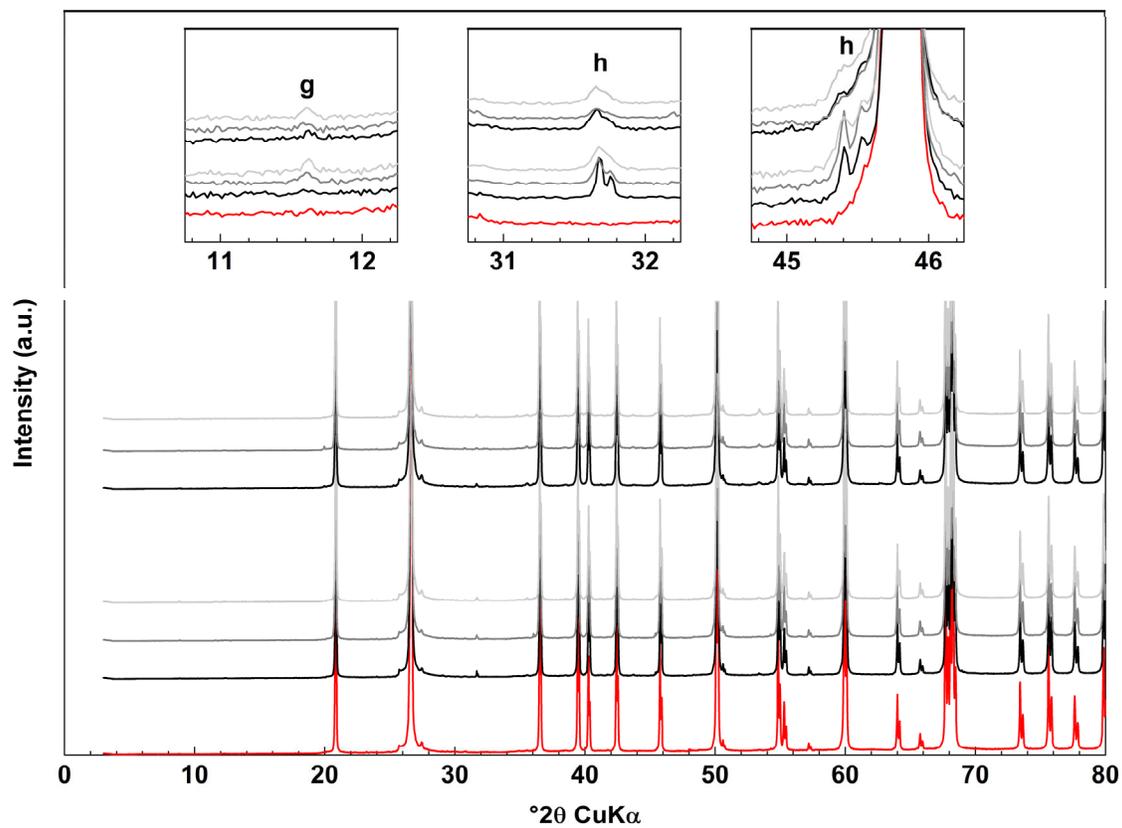


Figure S2. XRD pattern of powdered ES samples. Red: raw N45, ES cell 9/cell 10. Zoomed insets show reflections corresponding to gypsum (g) and halite (h). Quartz intensities have been cropped.

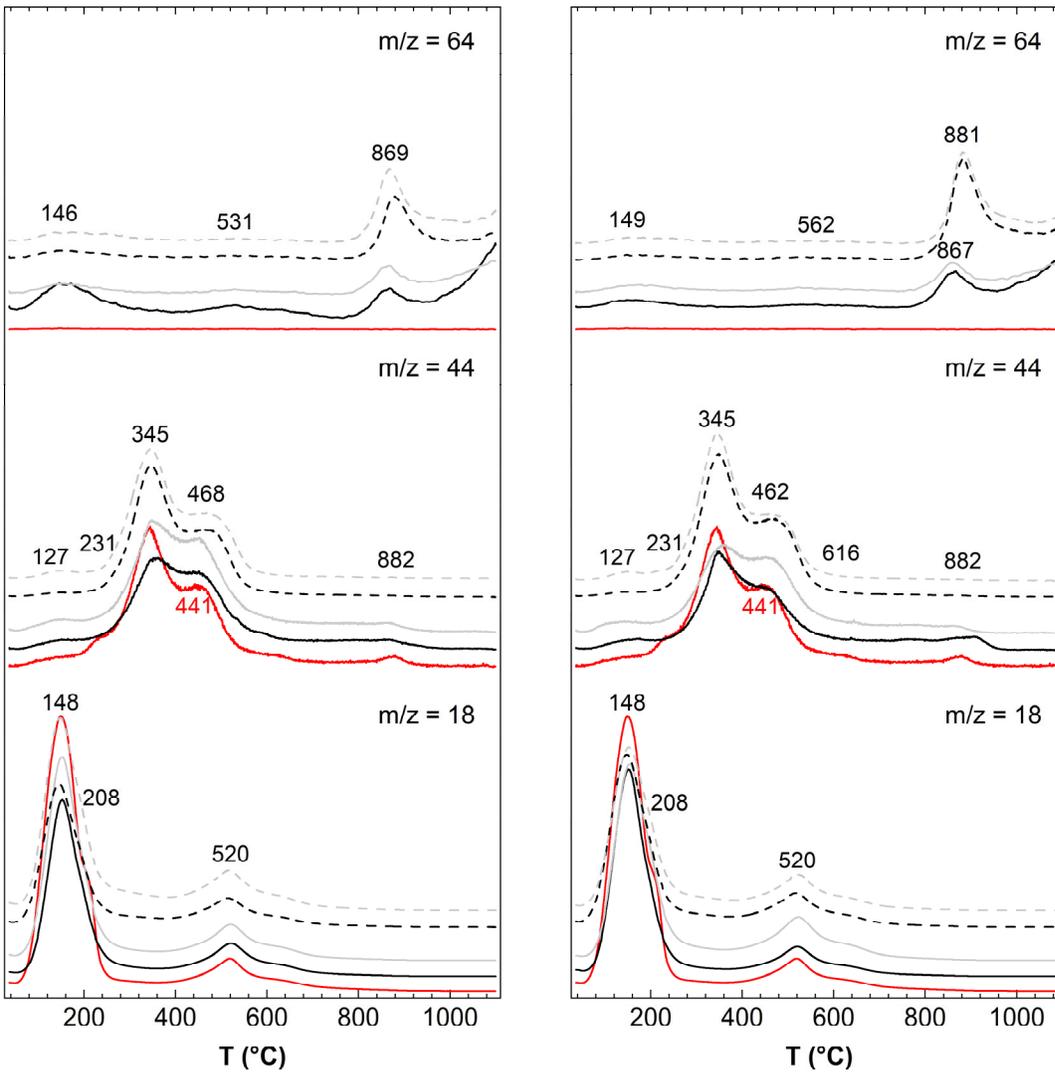


Figure S3. Mass spectrometer curves of evolved H_2O ($m/z = 18$, bottom), CO_2 ($m/z = 44$, middle) and SO_2 ($m/z = 64$, top) of bentonite granules of DS (y-axes arbitrary units not in scale) red: raw Secursol UHP, black: DS1 and grey DS2 cell 9 (left), cell 10 (right). Dotted lines: granular material from the respective DS.

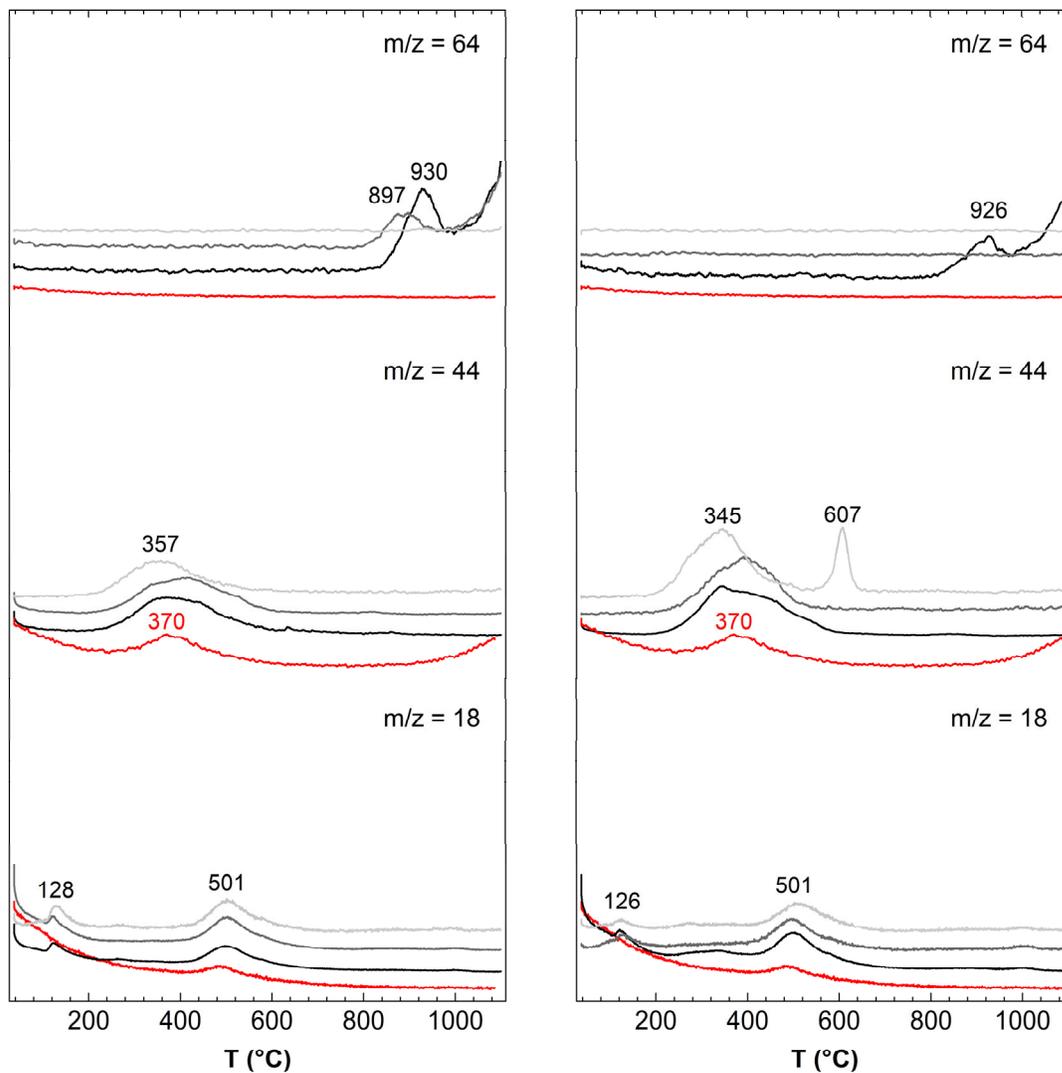


Figure S4. Mass spectrometer curves of evolved H₂O ($m/z = 18$, bottom), CO₂ ($m/z = 44$, middle) and SO₂ ($m/z = 64$, top) of ES (y-axes arbitrary units not in scale) cell 9 (left) and cell 10 (right). Red: N45 sand; black: ES1; dark grey: ES2; light grey: ES3.