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Supplementary Material

Fluorescing Layered Double Hydroxides as Tracer Materials for Particle Injection during Subsurface Water Remediation

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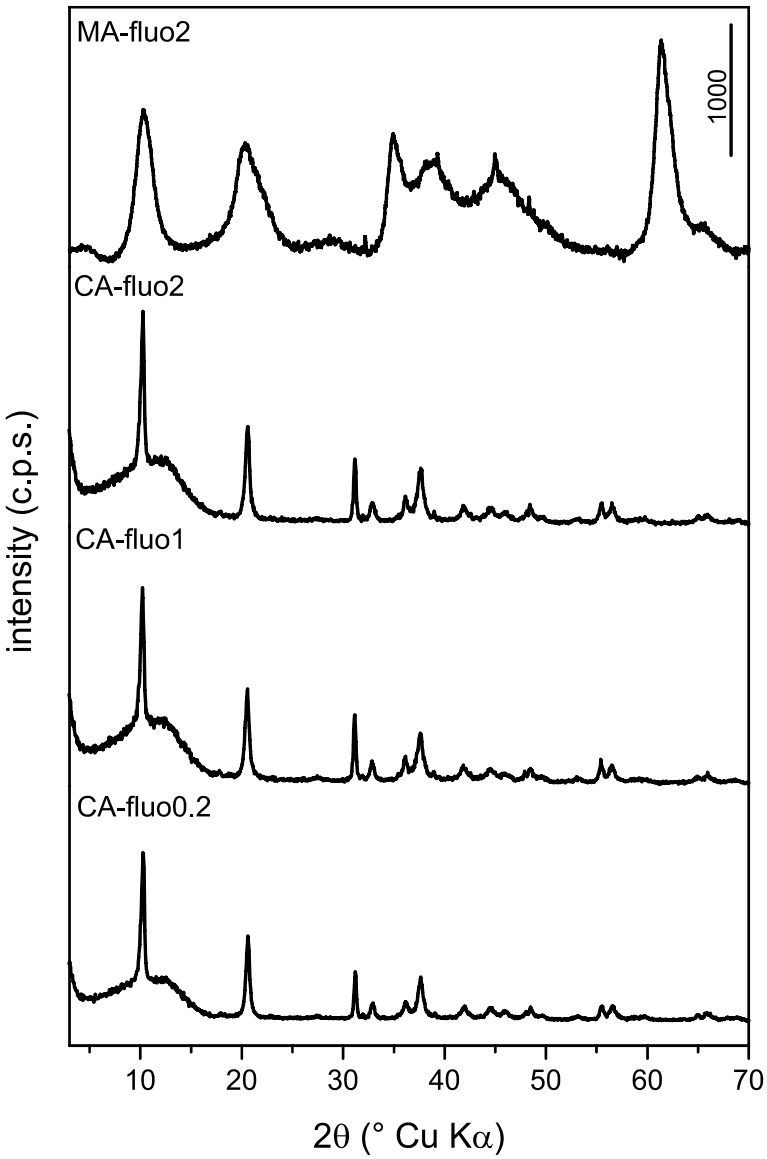


Figure S1. Powder X-Ray diffraction patterns of the fluorescein samples.

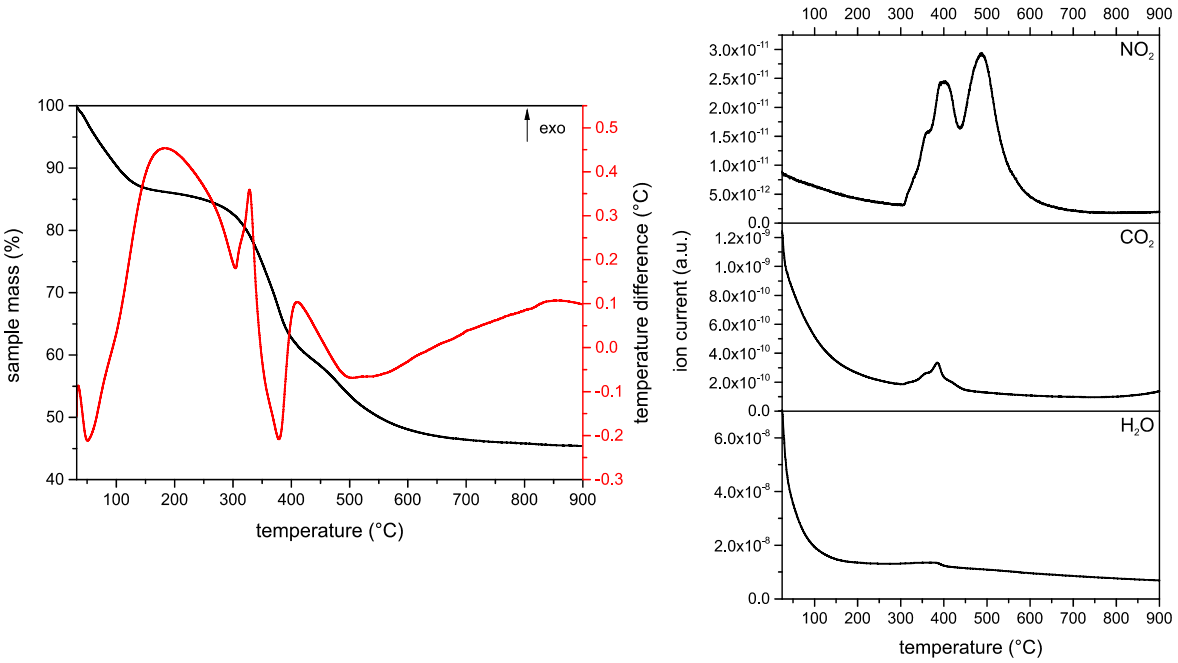


Figure S2. Thermogravimetric Analysis-Differential Thermal Analysis-Mass spectrometry (TG-DTA-MS) analysis of sample MA-fluo2.

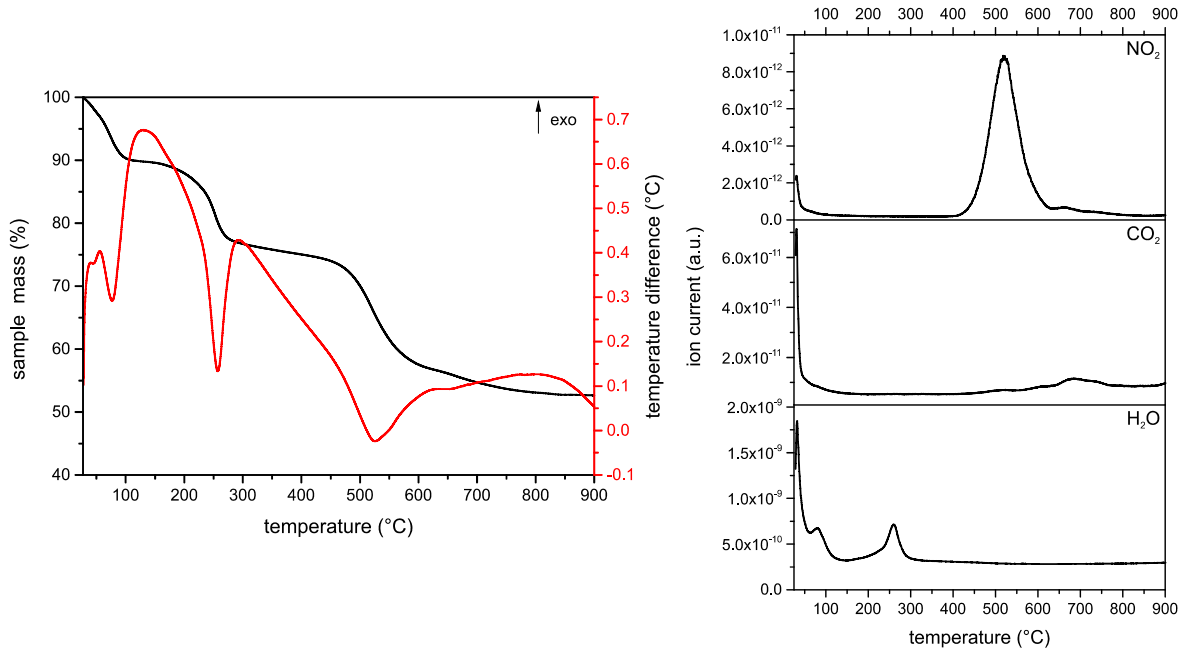


Figure S3. Thermogravimetric Analysis-Differential Thermal Analysis-Mass spectrometry (TG-DTA-MS) analysis of sample CA-fluo2.

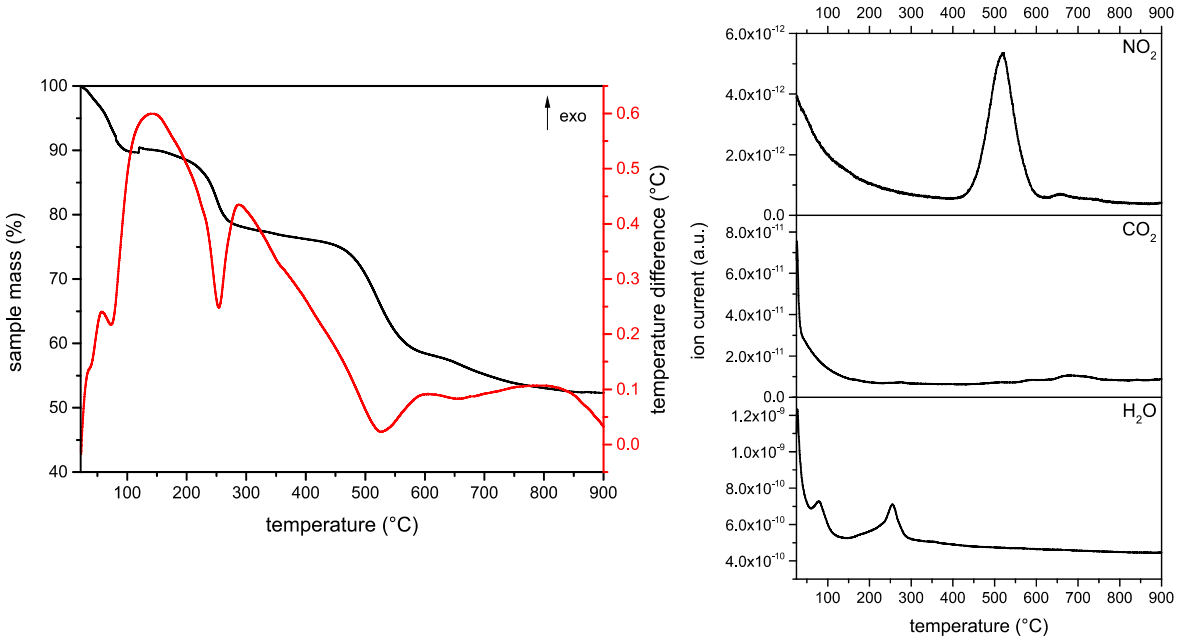


Figure S4. Thermogravimetric Analysis-Differential Thermal Analysis-Mass spectrometry (TG-DTA-MS) analysis of sample CA-fluo1.

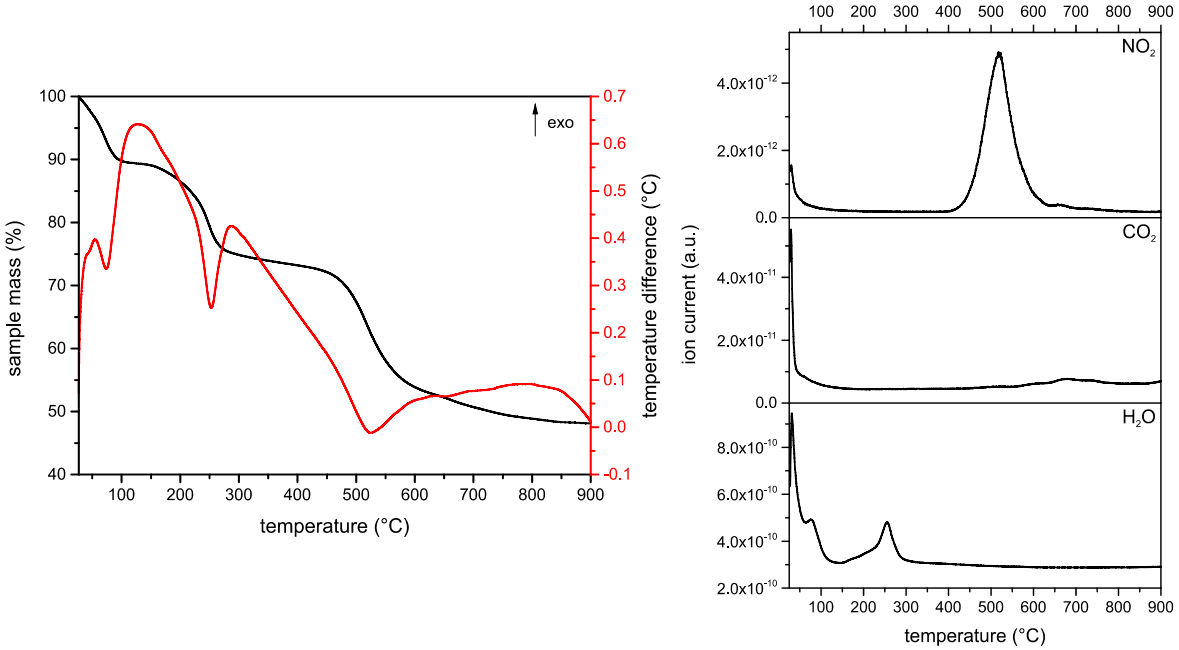


Figure S5. Thermogravimetric Analysis-Differential Thermal Analysis-Mass spectrometry (TG-DTA-MS) analysis of sample CA-fluo0.2.

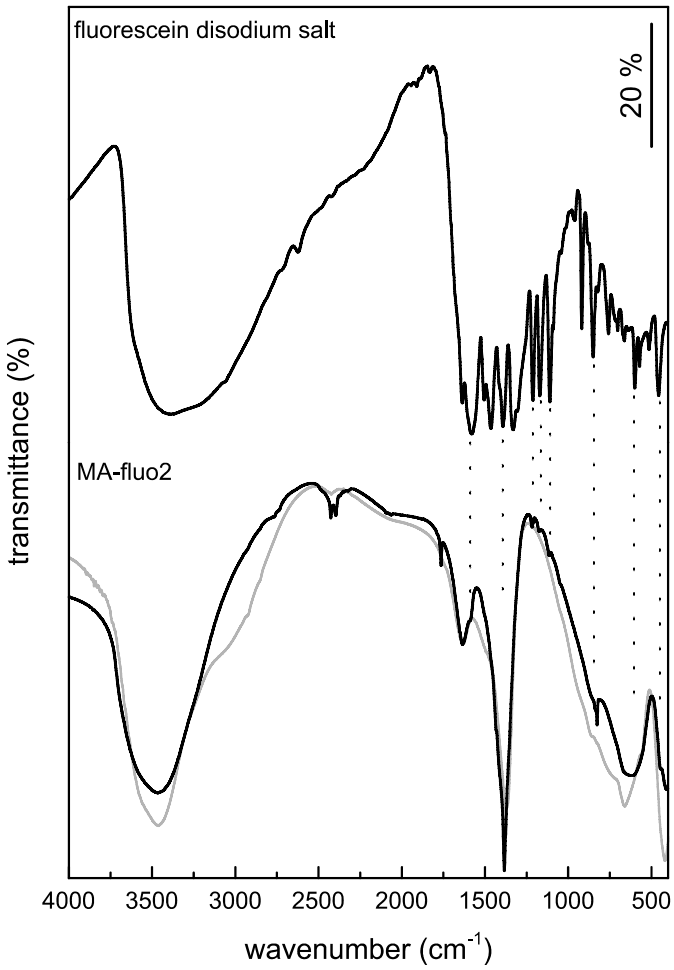


Figure S6. FTIR spectra of the unintercalated fluorescein disodium salt (top) and sample MA-fluo2 (bottom). Spectrum of the reference sample MA-CO_3 is included as grey line. Dotted lines indicate absorption bands caused by vibrations in the divalent fluorescein anion.

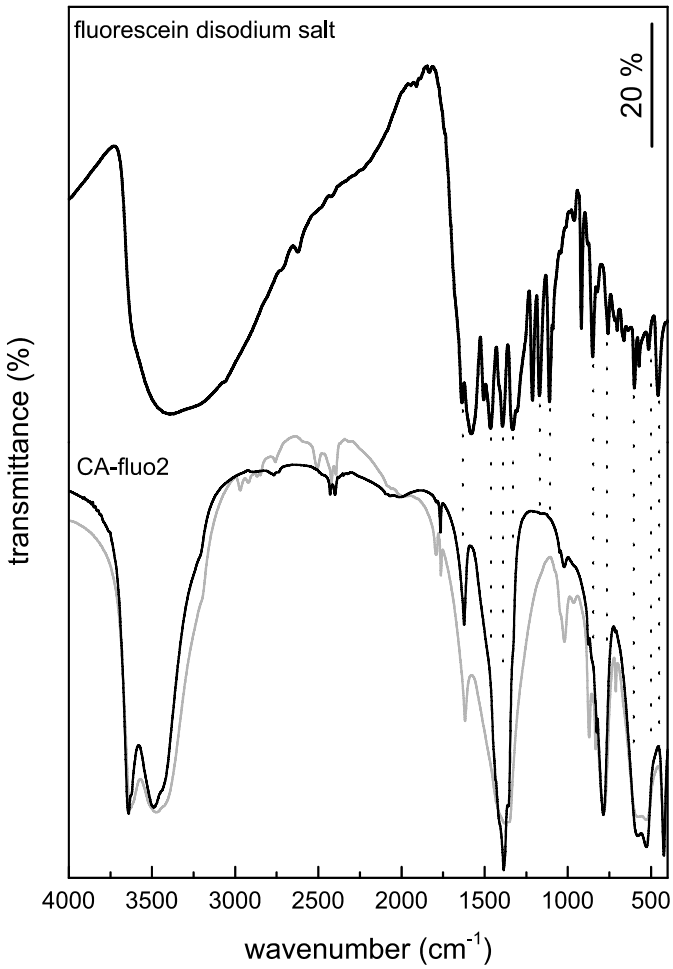


Figure 7. FTIR spectra of the unintercalated fluorescein disodium salt (top) and sample CA-fluo2 (bottom). Spectrum of the reference sample CA-CO_3 is included as grey line. Dotted lines indicate absorption bands caused by vibrations in the divalent fluorescein anion.

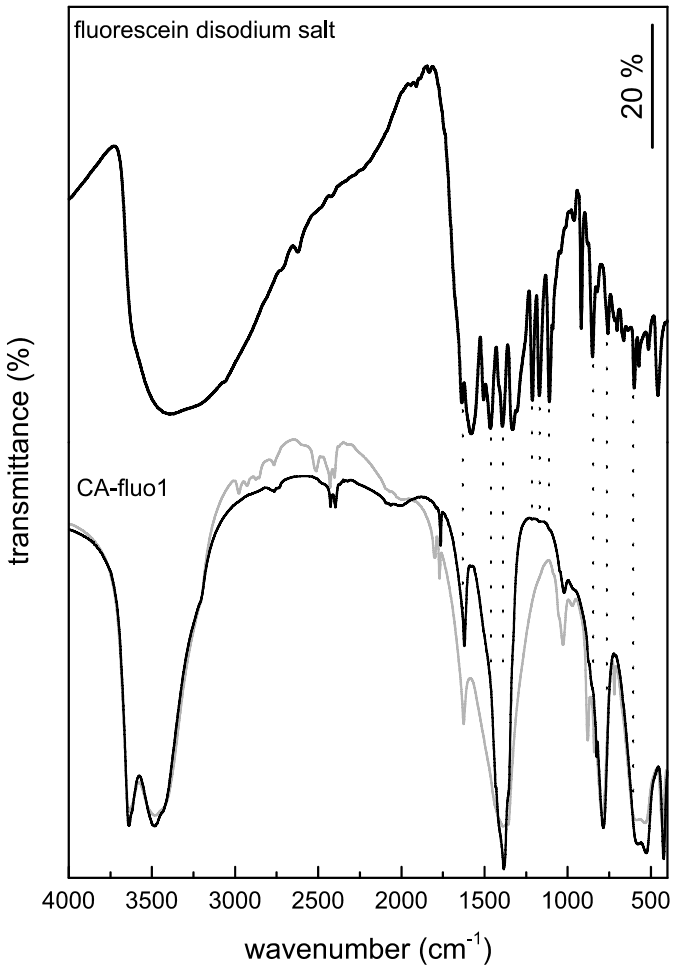


Figure S8. FTIR spectra of the unintercalated fluorescein disodium salt (top) and sample CA-fluo1 (bottom). Spectrum of the reference sample CA-CO_3 is included as grey line. Dotted lines indicate absorption bands caused by vibrations in the divalent fluorescein anion.

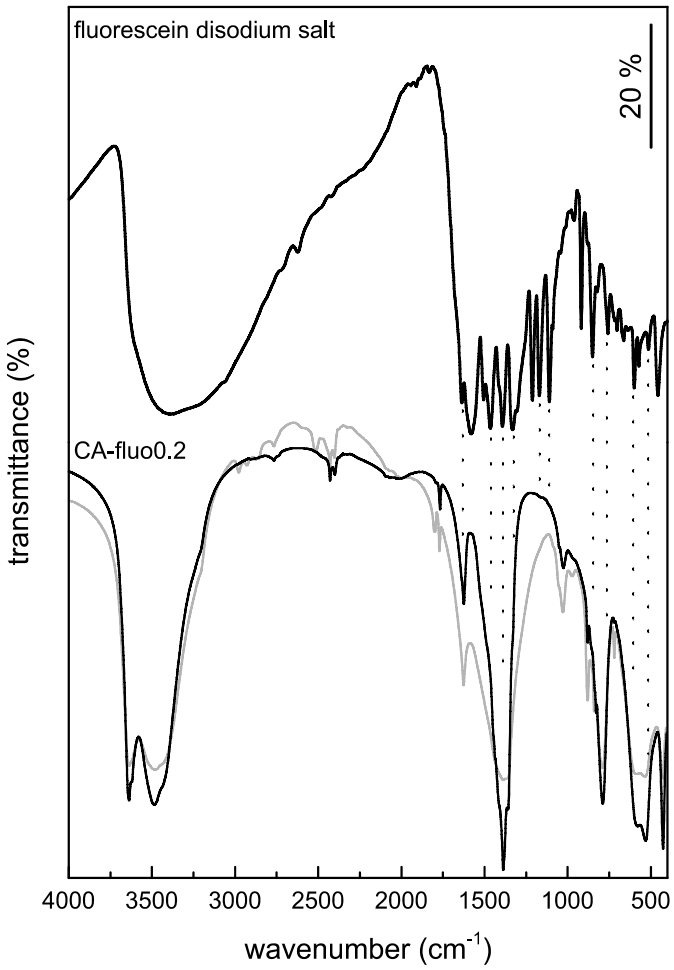


Figure S9. FTIR spectra of the unintercalated fluorescein disodium salt (top) and sample CA-fluo0.2 (bottom). Spectrum of the reference sample CA-CO_3 is included as grey line. Dotted lines indicate absorption bands caused by vibrations in the divalent fluorescein anion.

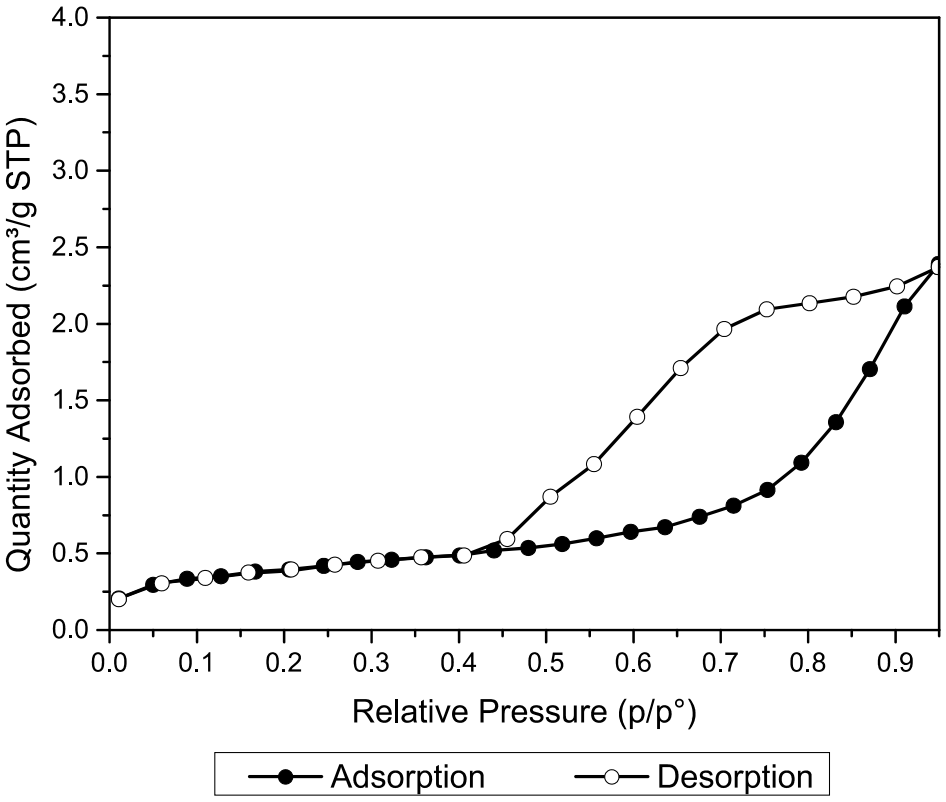


Figure S10. N_2 adsorption (filled circles)-desorption (empty circles) isotherm on sample MA-fluo2.

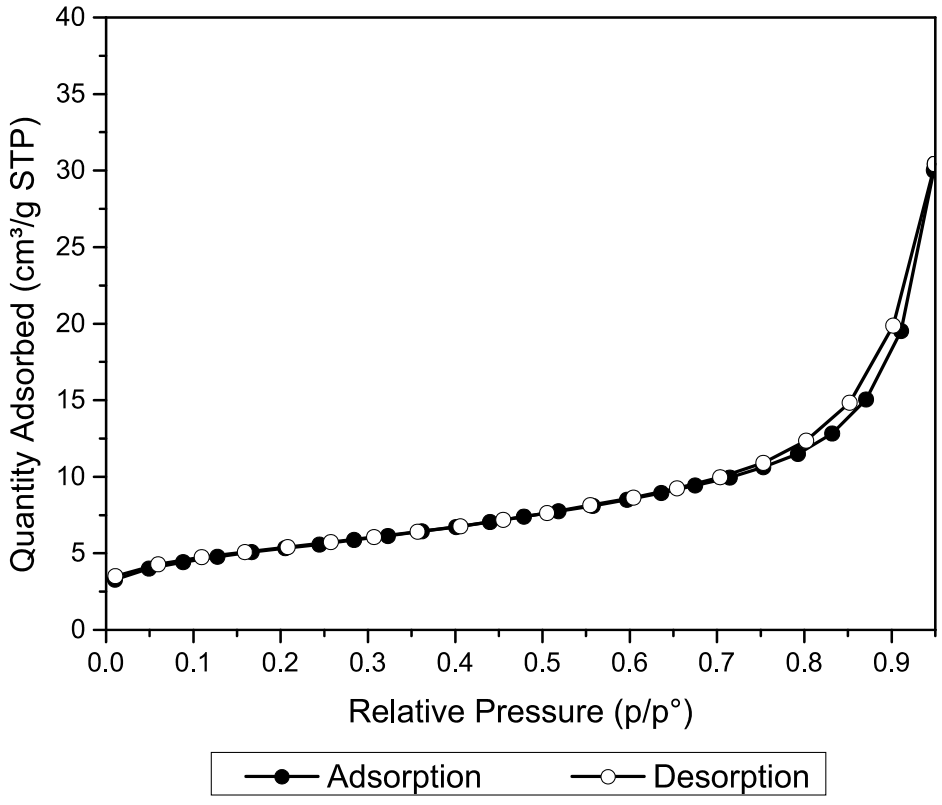


Figure S11. N_2 adsorption (filled circles)-desorption (empty circles) isotherm on sample CA-fluo2.

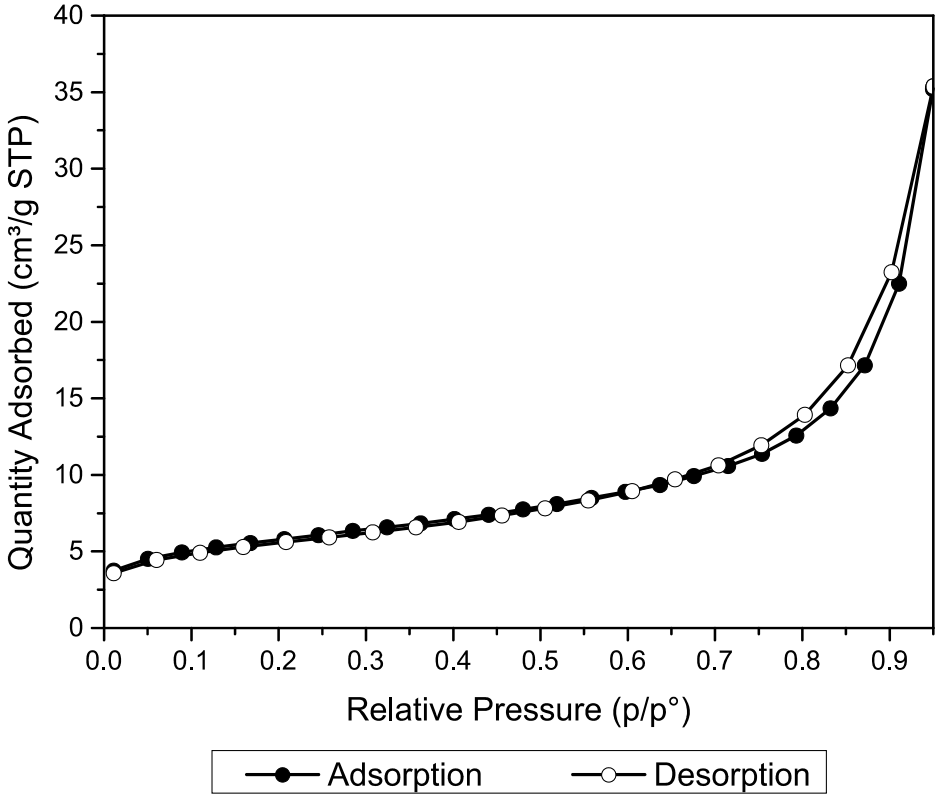


Figure S12. N_2 adsorption (filled circles)-desorption (empty circles) isotherm on sample CA-fluo1.

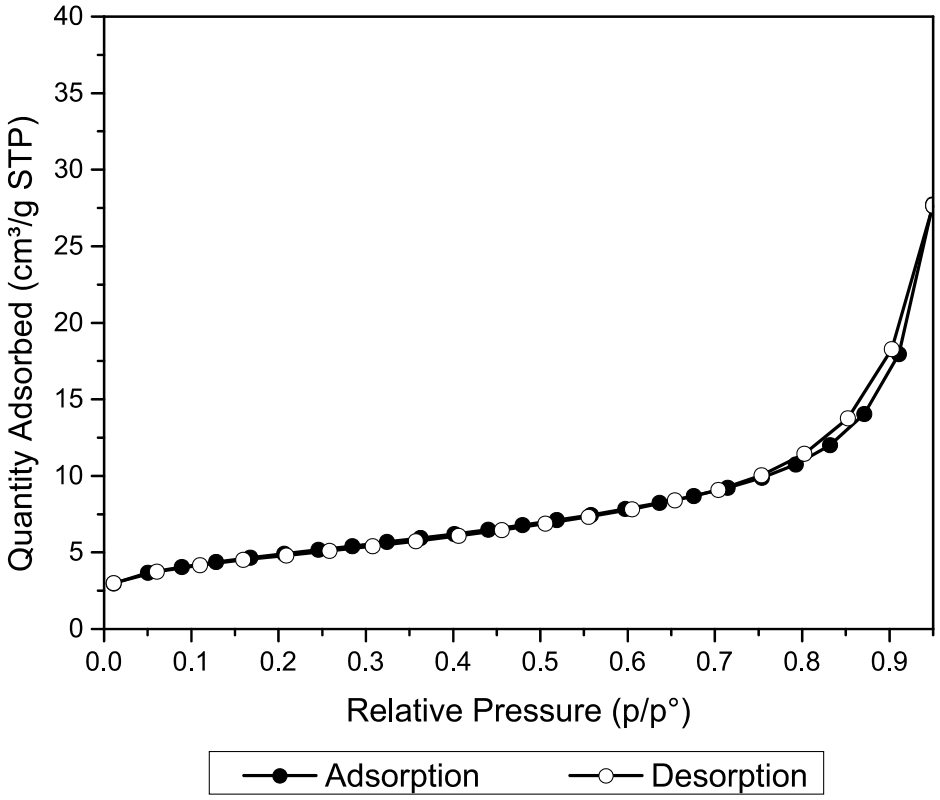


Figure S13. N_2 adsorption (filled circles)-desorption (empty circles) isotherm on sample CA-fluo0.2.

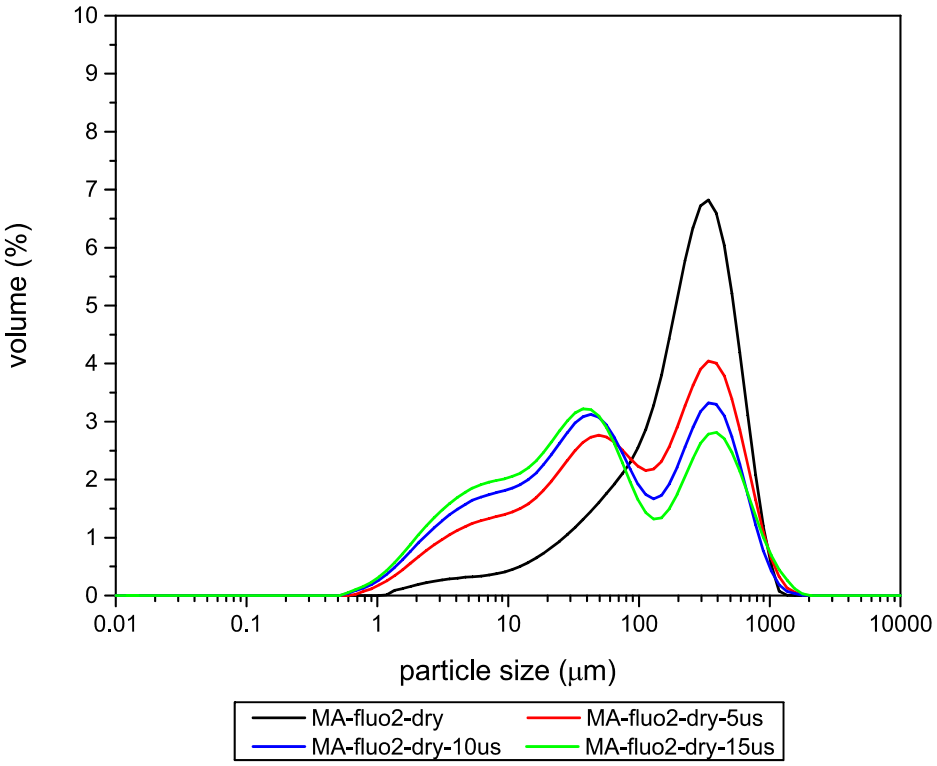


Figure S14. Particle size distribution of sample MA-fluo2 after different times (min) of ultrasound treatment using dried sample material.

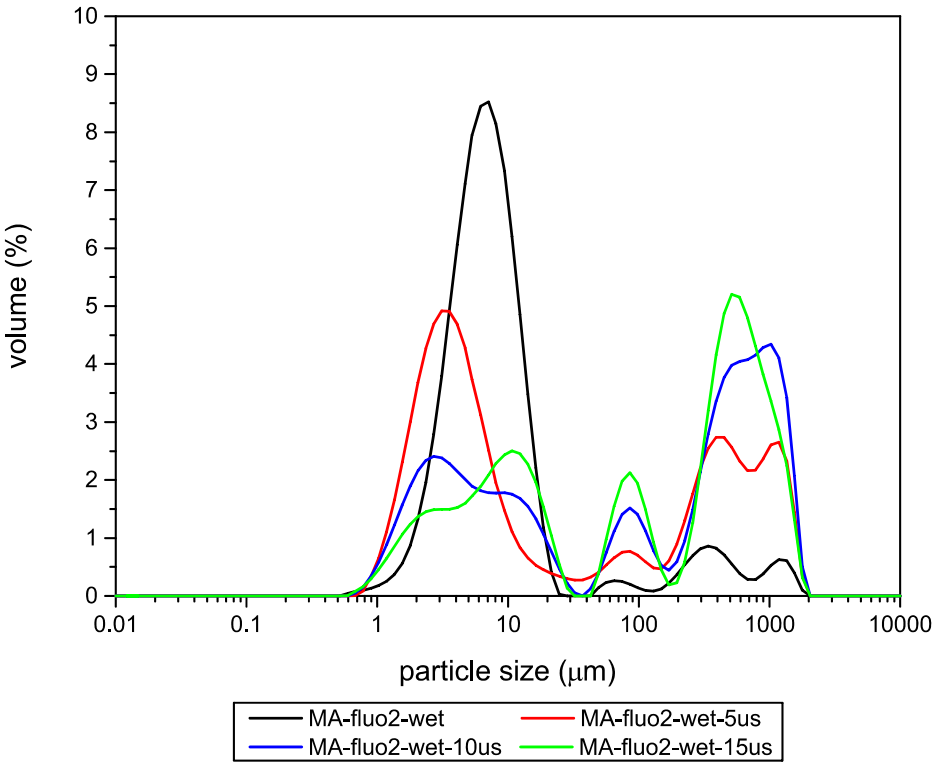


Figure S15. Particle size distribution of sample MA-fluo2 after different times (min) of ultrasound treatment using undried LDH slurry.

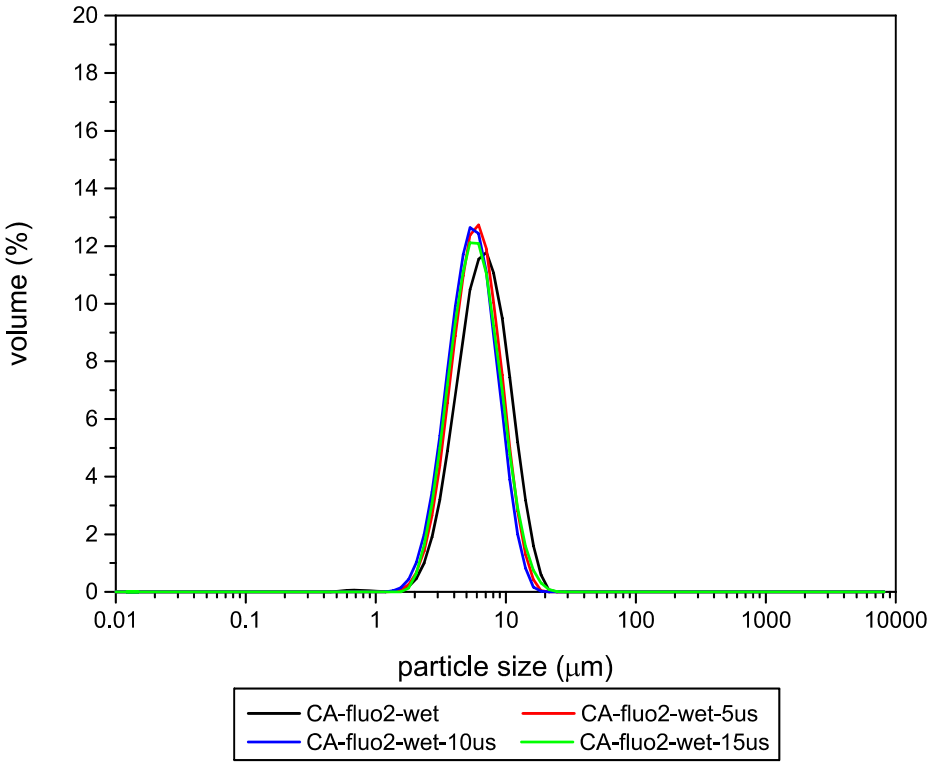


Figure S16. Particle size distribution of sample CA-fluo2 after different times (min) of ultrasound treatment using dried sample material.

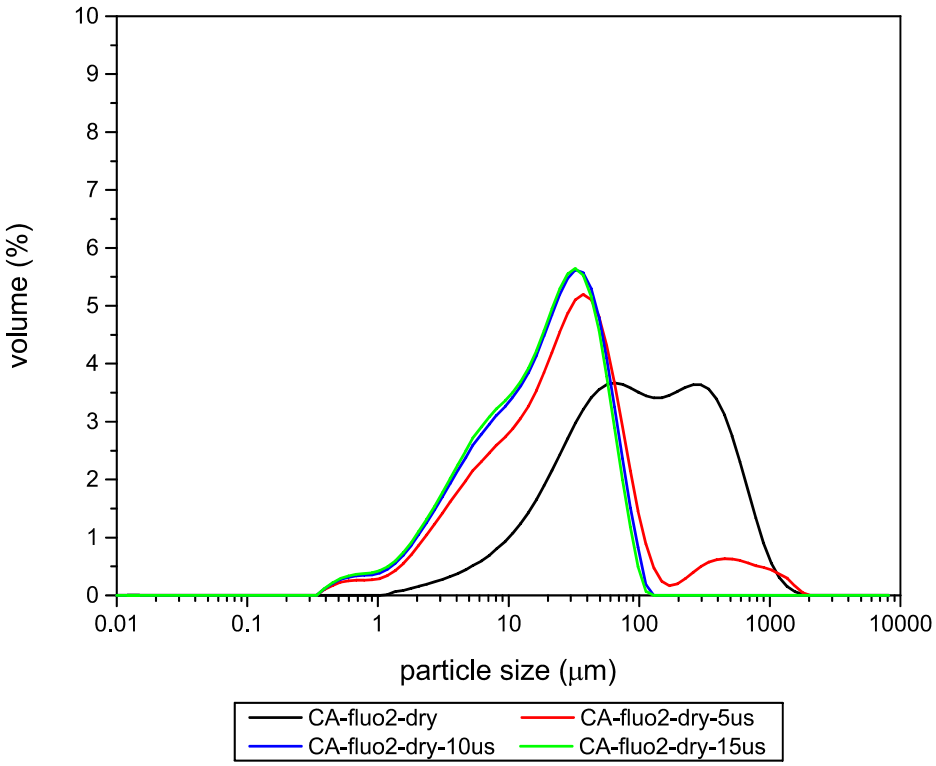


Figure S17. Particle size distribution of sample CA-fluo2 after different times (min) of ultrasound treatment using undried LDH slurry.

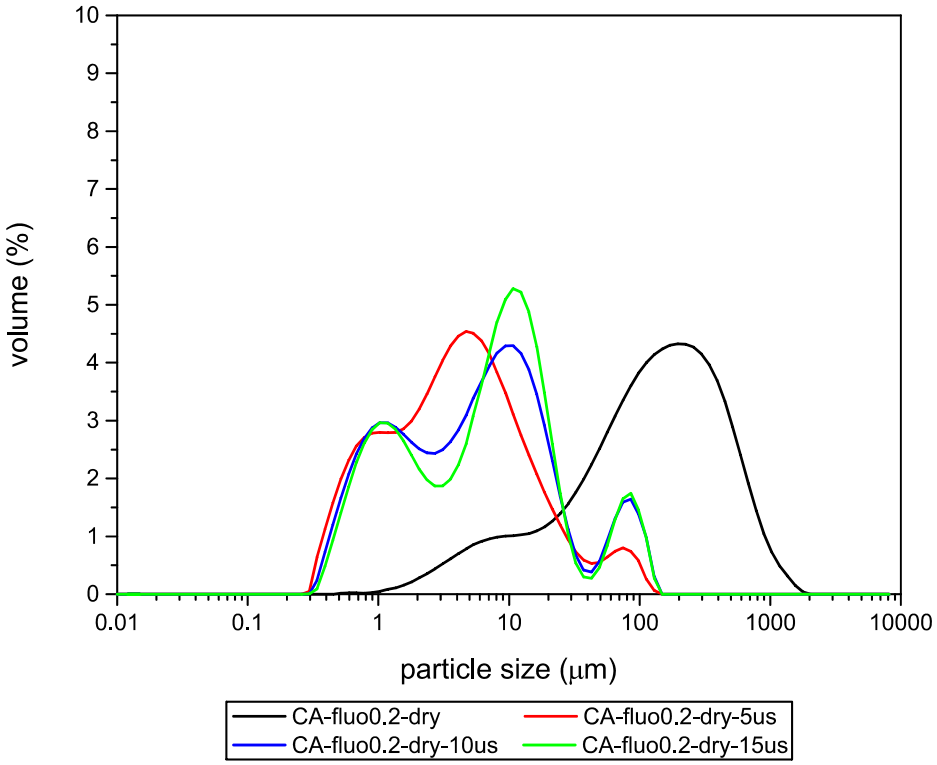


Figure S18. Particle size distribution of sample CA-fluo0.2 after different times (min) of ultrasound treatment using dried sample material.

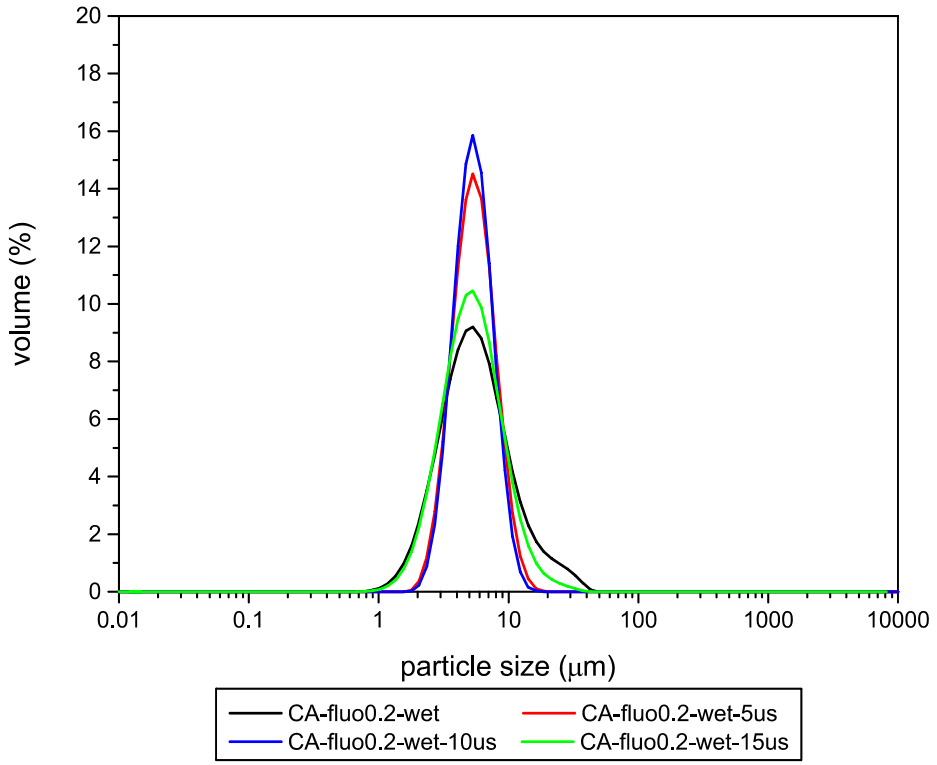


Figure S19. Particle size distribution of sample CA-fluo0.2 after different times (min) of ultrasound treatment using undried LDH slurry.

Table S1. List of chemicals used within this study.

chemicals	chemical formula	producer	purity
Aluminium oxide	Al_2O_3	Fluka	99.99%
Aluminium Nitrate 9-hydrate, pure	$Al(NO_3)_2 \cdot 9H_2O$	PanReac AppliChem ITW Reactants	min. 98%
Calcium Carbonate	$CaCO_3$	Sigma Aldrich	>99.995%
Calcium Nitrate tetrahydrate	$Ca(NO_3)_2 \cdot 4H_2O$	Scharlab	99.5%
Carbon dioxide,	CO_2	Air Liquide	>99.995%
Magnesium Nitrate 6-hydrate, for analysis	$Mg(NO_3)_2 \cdot 9H_2O$	PanReac AppliChem ITW Reactants	min. 98%
Magnesium Sulfate	$MgSO_4$	PanReac AppliChem ITW Reactants	>98%
Fluorescein Disodium Salt (Uranine)	$C_{20}H_{10}O_5Na_2$	Manuel Riesgo, S.L.	min. 95%
Oxygen, compressed	O_2	Alphagaz, Air Liquide	>99.995%
Potassium Bromide	KBr	Scharlab	IR spectroscopy grade
Sodium Chloride	NaCl	Sigma Aldrich	>99%
Sodium Hydroxide	NaOH	PanReac AppliChem ITW Reactants	98%
Quartz Sand (0.18-0.71 mm)	SiO_2	Dansand	>96%