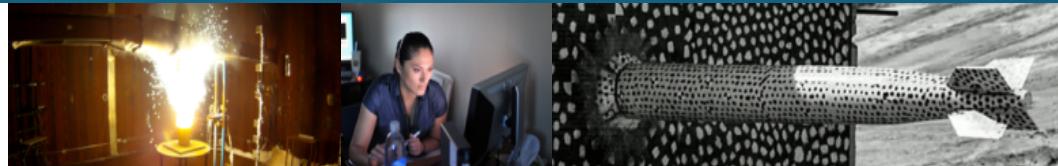




NEUP IMEBM Project: Preliminary Solubility Experiments on Bentonite and Basalt Fibers – July 2021



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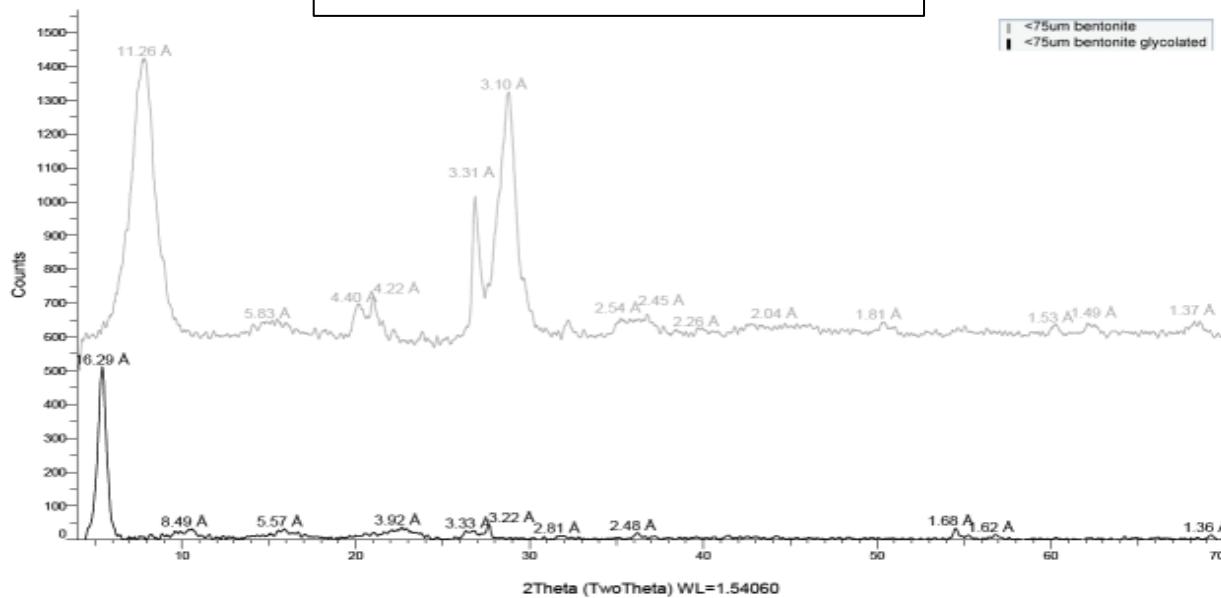
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Bentonite Solubility – XRD Analysis

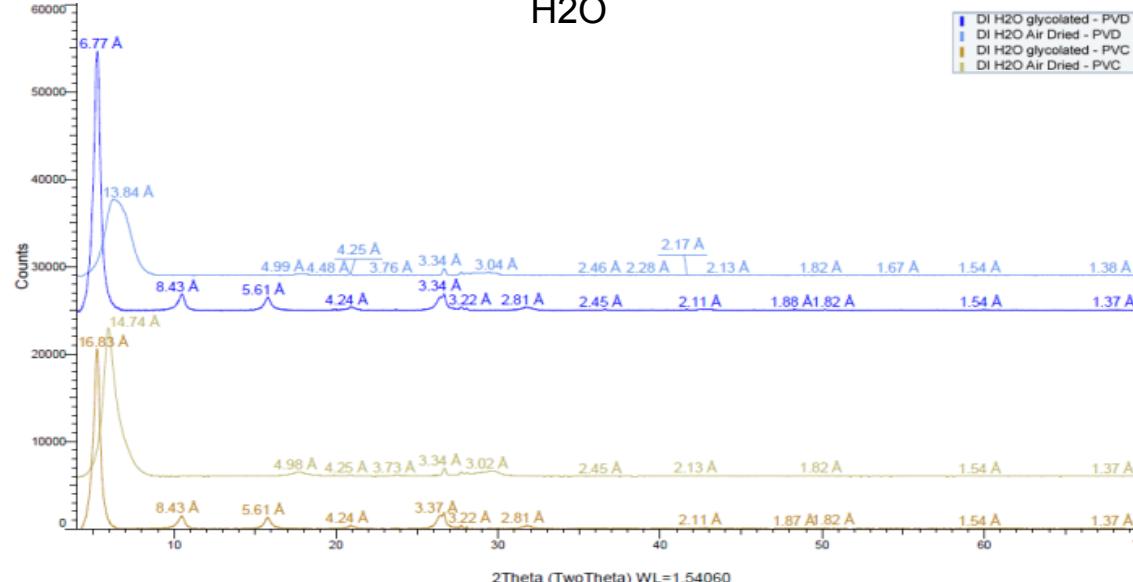


Baseline Bentonite



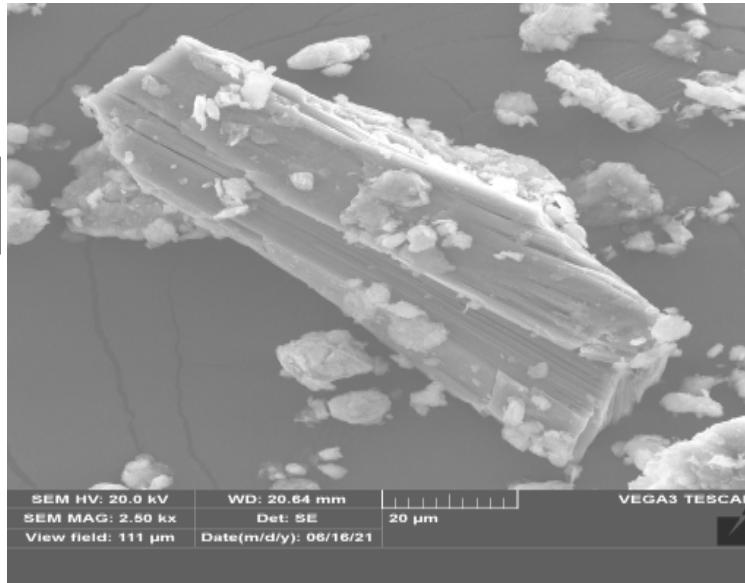
Bentonite Hydrothermal Exp. –

H₂O

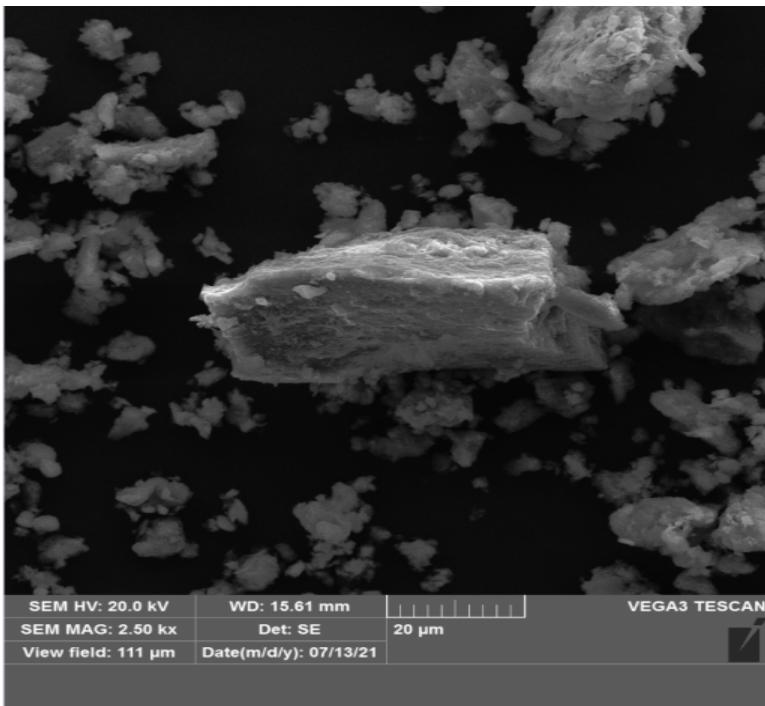




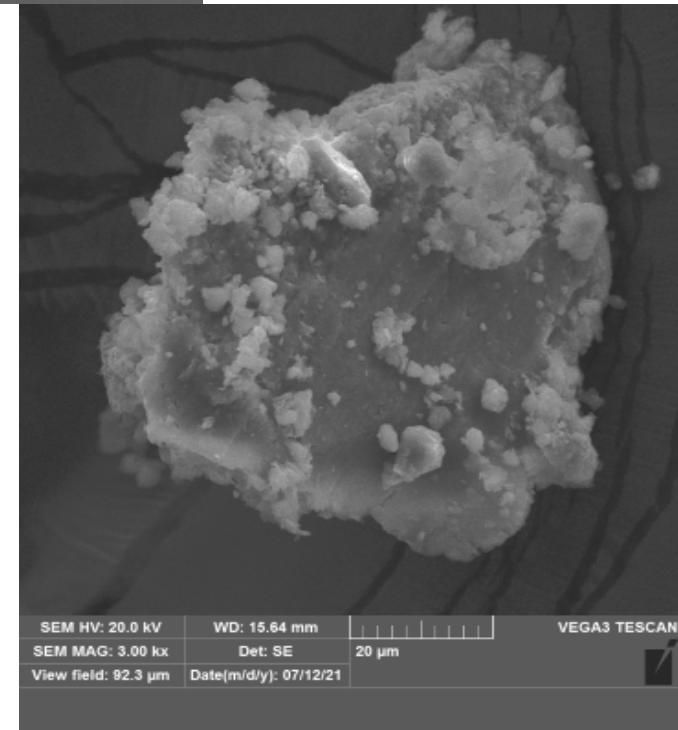
SEM on Bentonite



<75um Bentonite
Starting Material

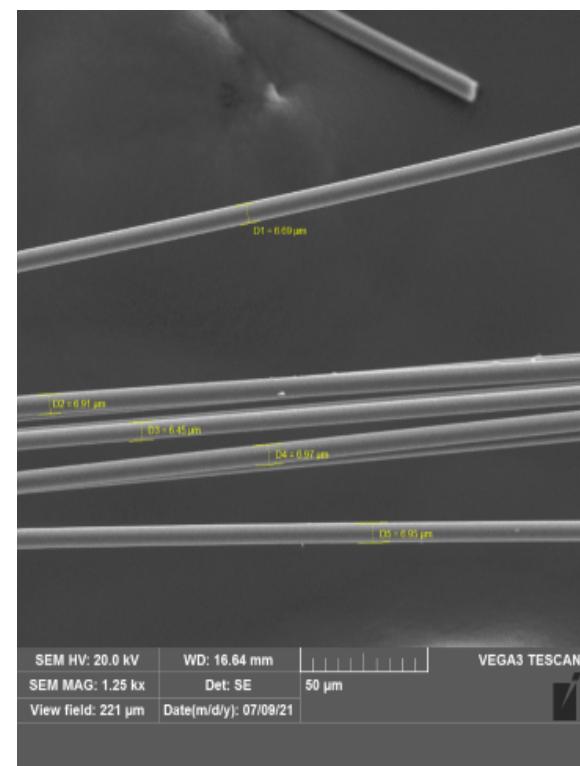
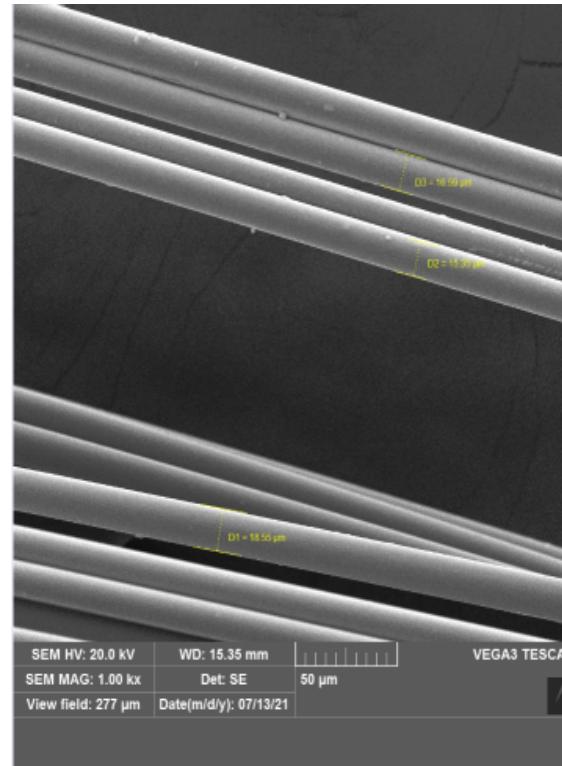
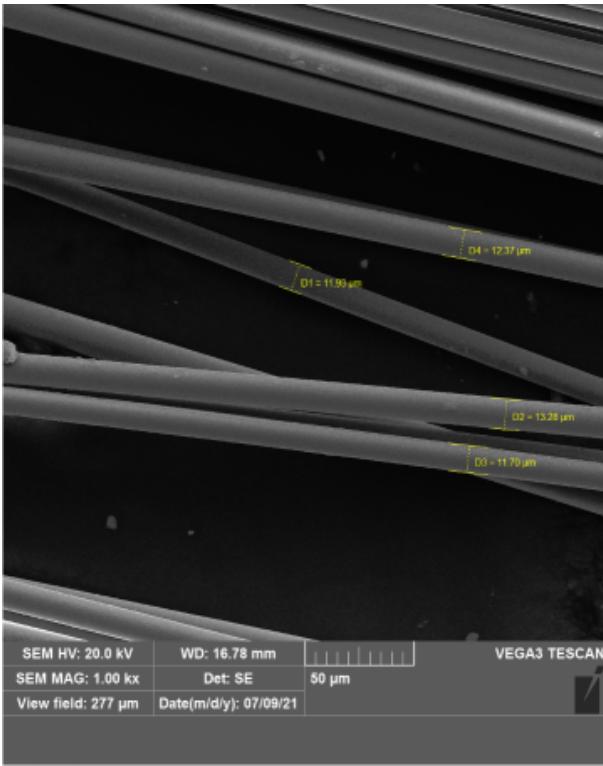


Bentonite-H₂O-PVC



Bentonite-H₂O-PVD

SEM on Fibers



12.5mm Basalt
 F $D_{\text{average}} = 12.32$
 μ m

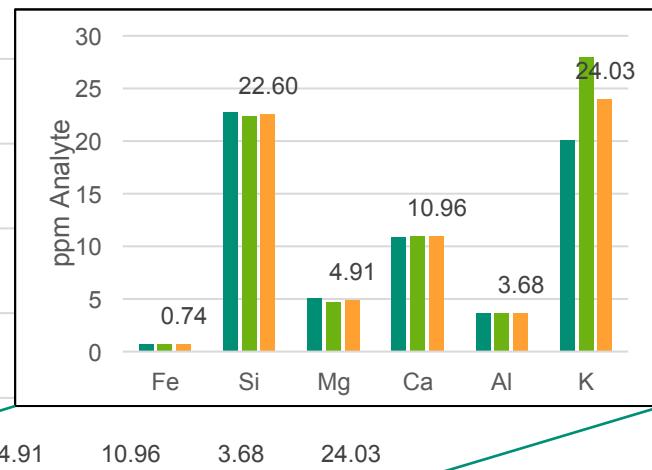
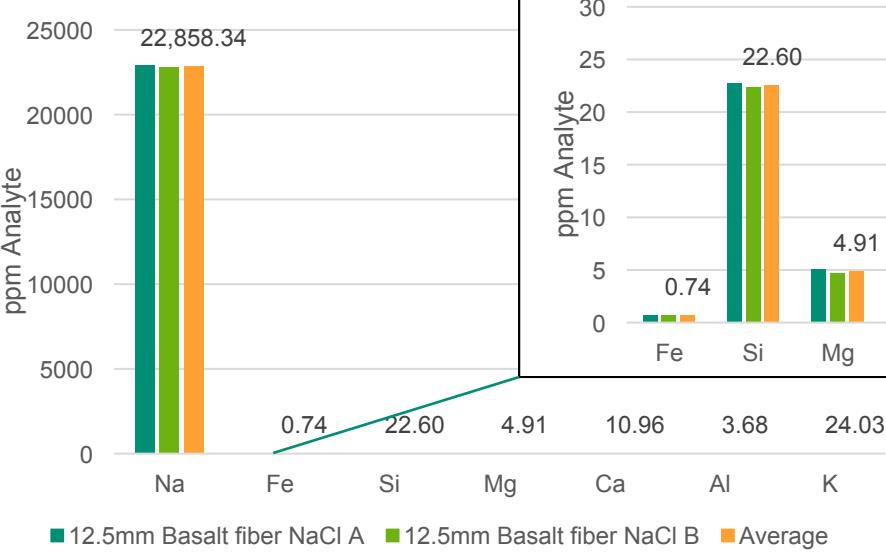
12.5mm Glass Fiber
 D $D_{\text{average}} = 16.83$
 μ m

12.5mm
 C $D_{\text{average}} = 6.79$ μ m

Solubility Experiments – ICP-OES

Basalt Fibers – 1M NaCl

NaCl



■ 12.5mm Basalt fiber NaCl A ■ 12.5mm Basalt fiber NaCl B ■ Average

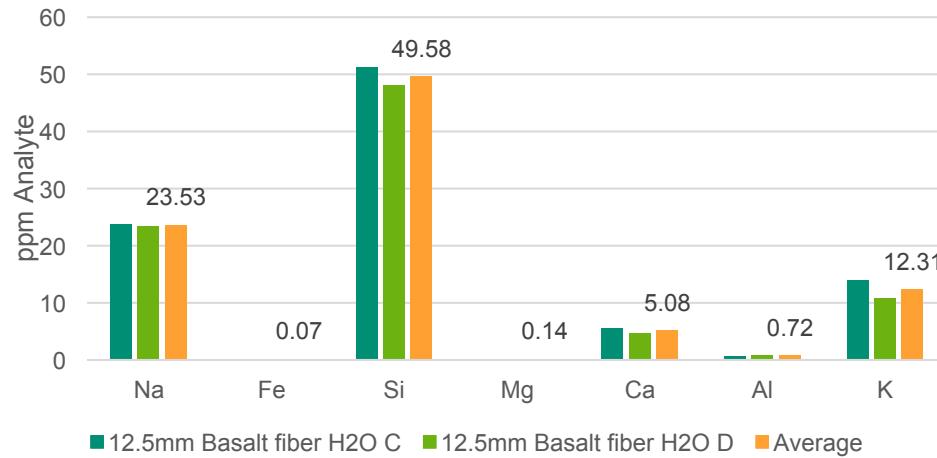
- Close-system Parr Reactors
- Runs done in duplicates
- 12.5mm basalt fiber size
- Experiment duration: 21 days
- Water/liquid ratio: 50
- Temperature: 150°C

pH Analysis before & after hydrothermal treatment

Vessel #	Sample ID	initial pH	final pH
A	Basalt fiber-12.5 mm-NaCl-50	8.98	7.18
B	Basalt fiber-12.5 mm-NaCl-50	8.95	6.98
C	Basalt fiber-12.5 mm-H2O-50	9.00	9.03
D	Basalt fiber-12.5 mm-H2O-50	7.56	9.21

Reactor Solution	initial pH
1M NaCl	6.15
DI H2O	6.16

Basalt Fibers – DI H2O



■ 12.5mm Basalt fiber H2O C ■ 12.5mm Basalt fiber H2O D ■ Average

Future Work

- Geochemical modeling of solute chemistry (EQ3/6)
- XRF analyses on starting material and reaction products
- XRD and SEM analysis on bentonite and basalt fiber reacted in DI water and 1M NaCl
- Solubility experiments: Glass fiber in DI water and 1M NaCl
- Experimental design of flow-through reaction experiments on bentonite-fiber mixtures

Sample	Particle/Fiber Size	Reactor Fluid	Water/Rock Ratio	Reaction Temperature	Reaction Time
Bentonite	<2µm, <75µm, granules	DI Water / 1M NaCl	50	150 °C	21 days
Glass Fiber	crushed / 12.5 mm	DI Water / 1M NaCl	50	150 °C	21 days
Basalt Fiber	crushed / 12.5 mm	DI Water / 1M NaCl	50	150 °C	21 days
Carbon Fiber	crushed / 12.5 mm	DI Water / 1M NaCl	50	150 °C	21 days

