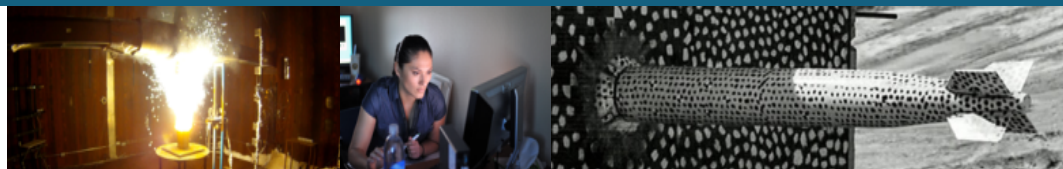




NEUP IMEBM Project: Preliminary Solubility Experiments on Bentonite and Basalt Fibers – July 2021



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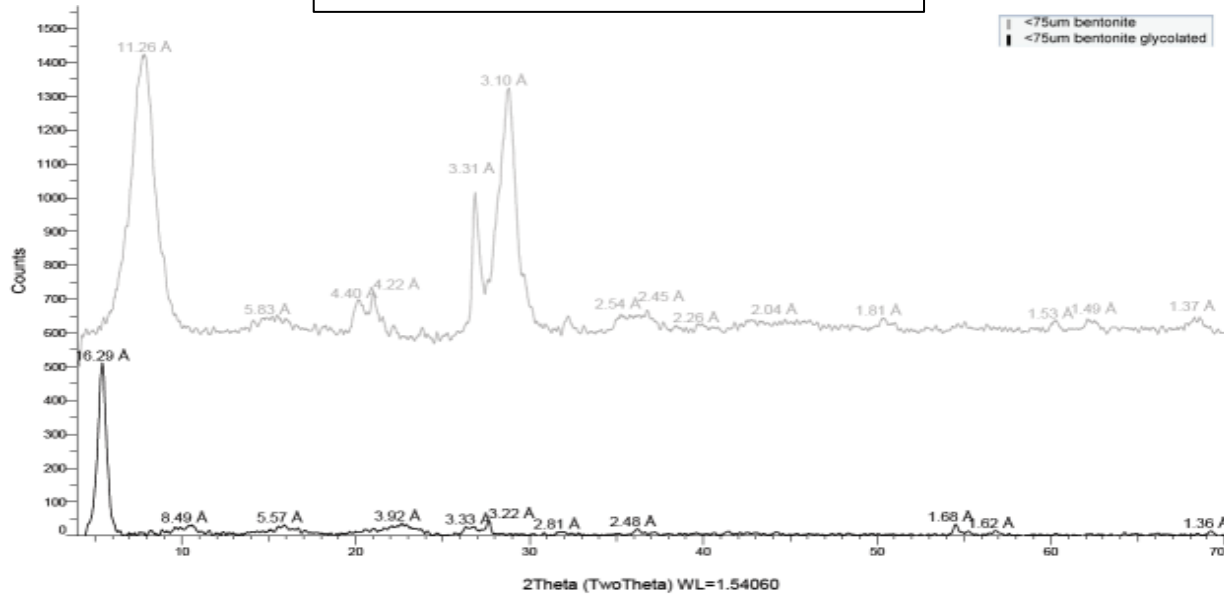


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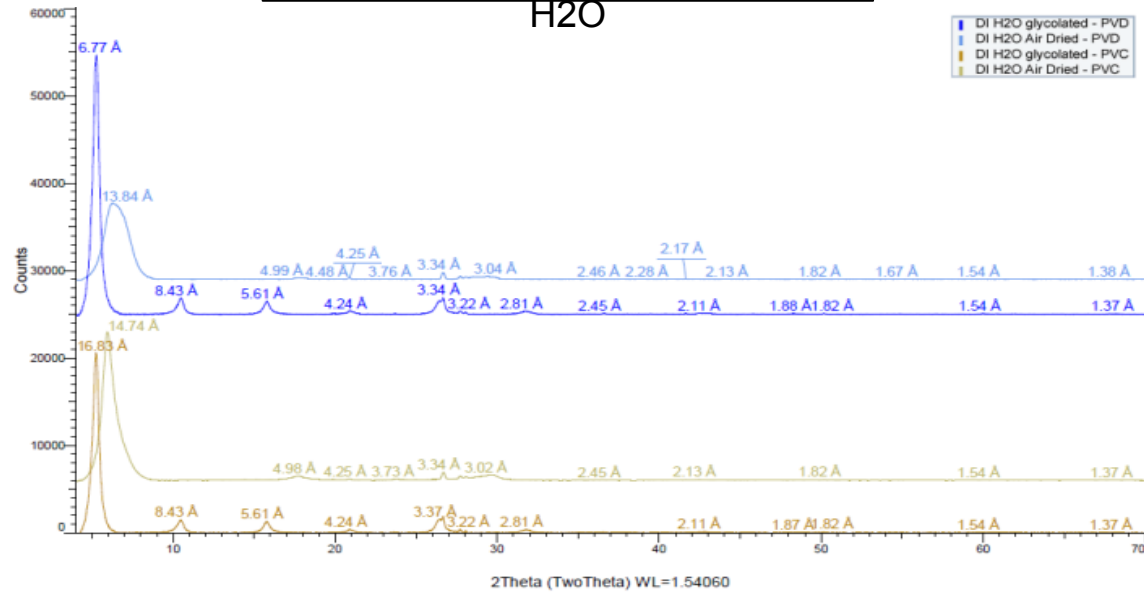
Bentonite Solubility – XRD Analysis



Baseline Bentonite



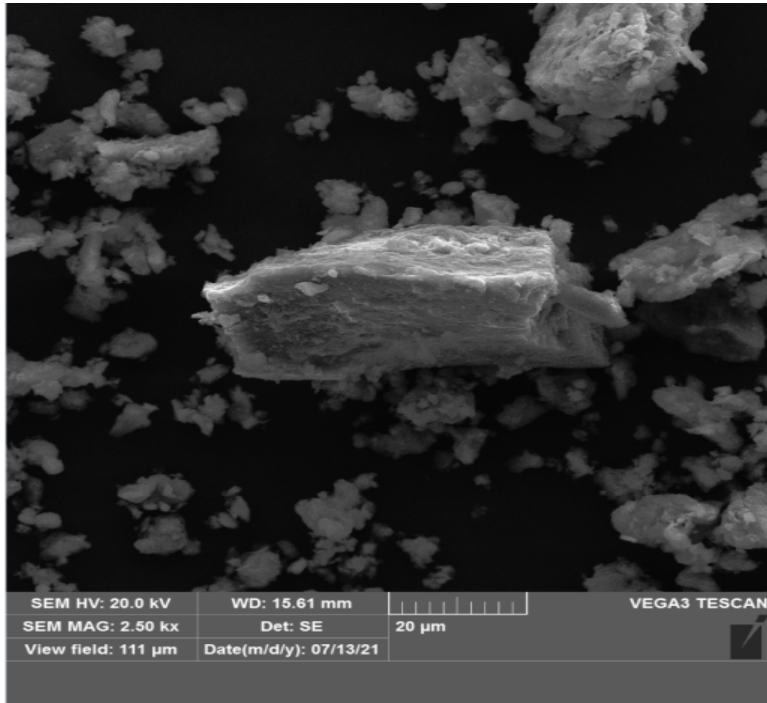
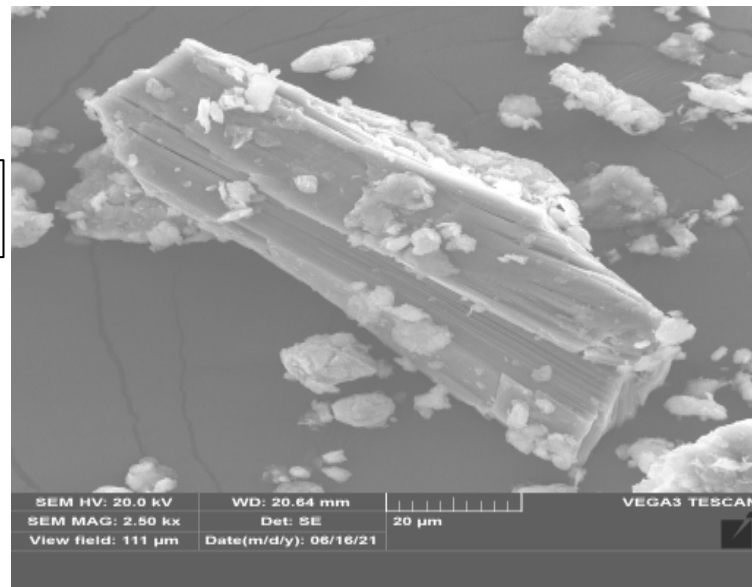
Bentonite Hydrothermal Exp. –
H₂O



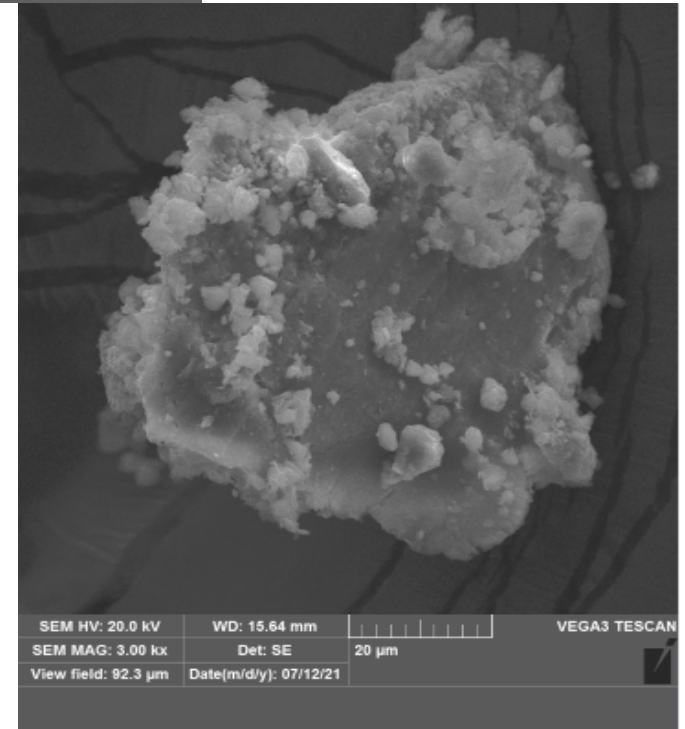
SEM on Bentonite



<75um Bentonite
Starting Material

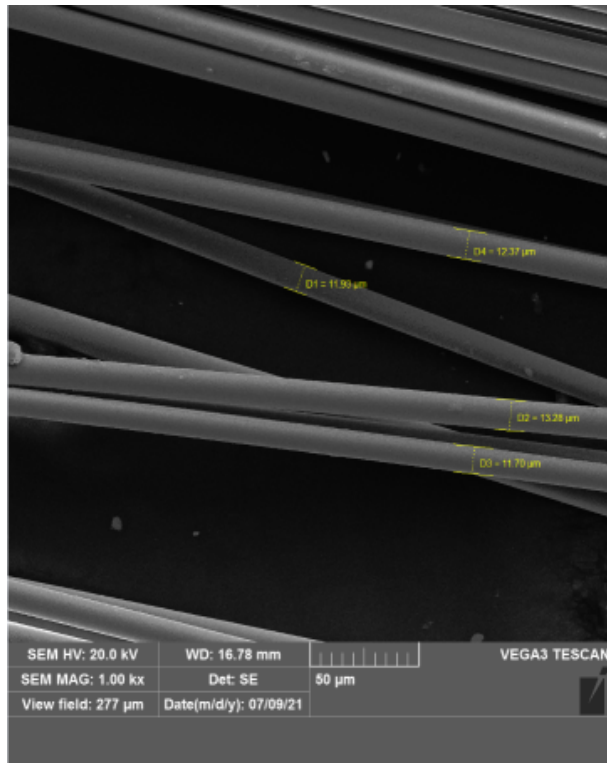


Bentonite-H₂O-PVC



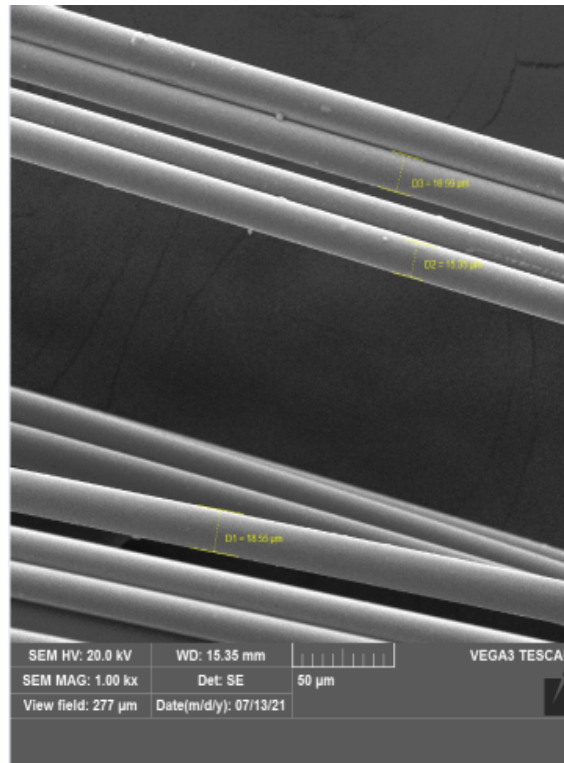
Bentonite-H₂O-PVD

SEM on Fibers



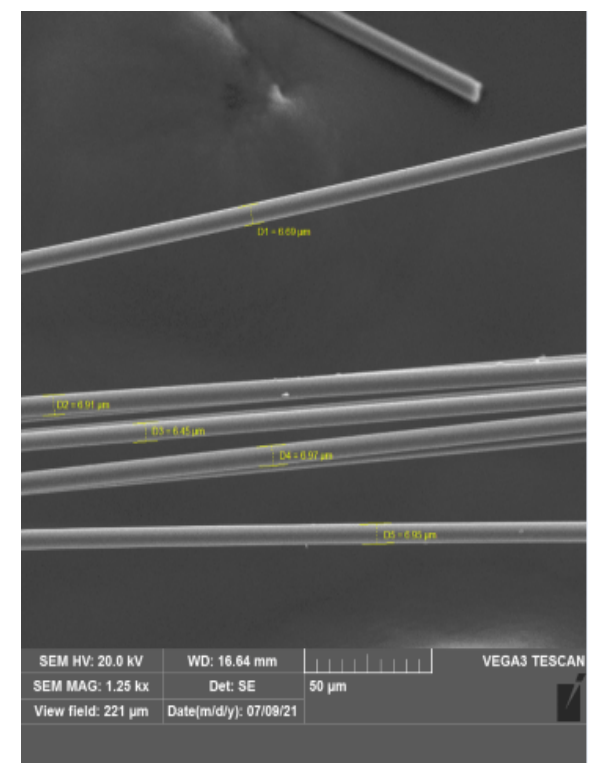
12.5mm Basalt

$$D_{\text{average}} = 12.32 \mu\text{m}$$



12.5mm Glass Fiber

$$D_{\text{average}} = 16.83 \mu\text{m}$$



12.5mm

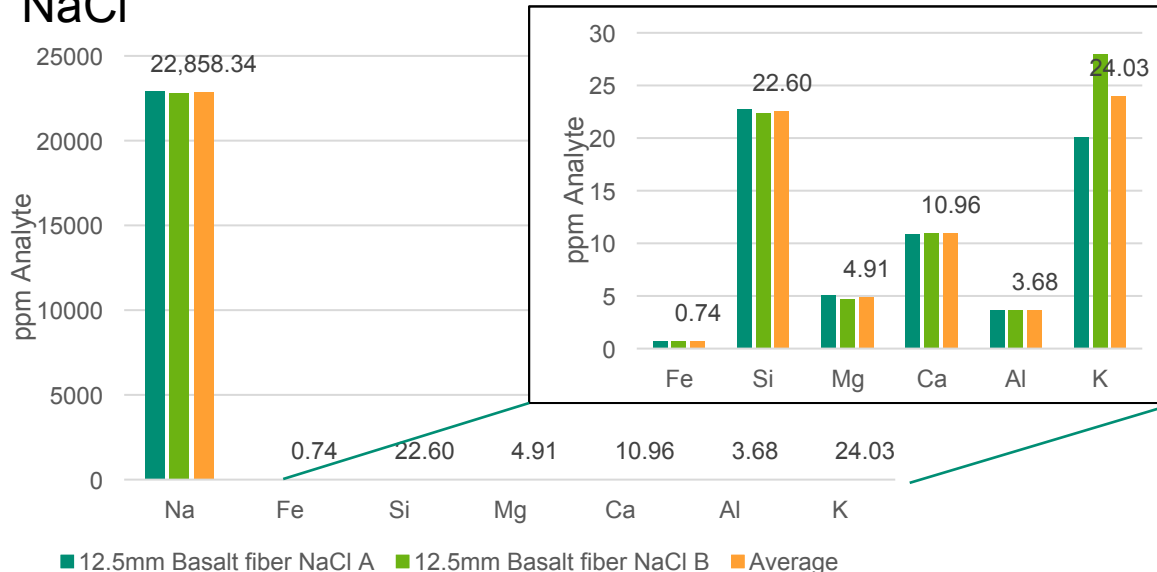
$$D_{\text{average}} = 6.79 \mu\text{m}$$



Solubility Experiments – ICP-OES

Basalt Fibers – 1M NaCl

NaCl



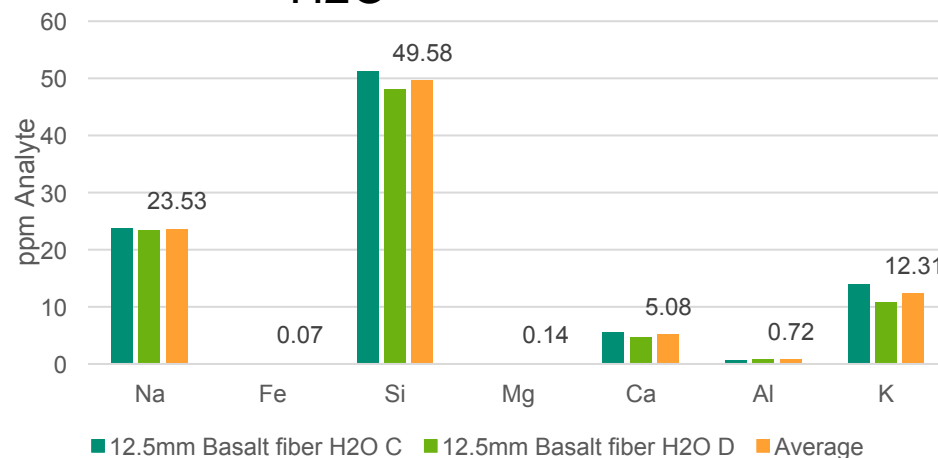
pH Analysis before & after hydrothermal treatment

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

H2O



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

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	<2 μ m, <75 μ m, 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

