
LABORATORY PROTOCOL FOR THE FLOW THROUGH EXPERIMENT

Personal Protective Equipment:

- Gloves
- Goggles
- Lab Coat

Chemicals Needed:

- HATCH Reagents for HR Nitrate
- 10 mL of Purolite A520E

Materials Needed:

- Lab Bench With:
 - 56" Constant head source
 - Column stands
 - 100 mL acrylic columns
 - 5 Gallon bucket for waste
 - Globe valve to control flow
 - Rubber tubing
 - Various clamps and connectors
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PART 1: PRECONDITION THE A520E STRONG BASE ANION EXCHANGE RESIN

Additional Chemicals:

- 125 grams of NaCl

Additional Materials:

- 2000 mL erlenmeyer flask
- 12 L of DI water
- Hot plate
- 20 L of tap water
- 2 x 20 L water containers one for the 125 g NaCl per liter solution and 1 for the tap water

The A520E resin requires a few bed volumes of solution to precondition the resin prior to use.

- 1) Add glass wool to just over the 1 mL mark on each of the experimental columns.
- 2) Measure out 10 mL of Purolite A520E strong base anion exchange
- 3) Prepare a total of 20 L of 8 grams NaCl per liter solution. To get to 8 grams NaCl per liter add 2500 grams of NaCl to a 2000 mL erlenmeyer flask with 1500 mL of DI water.
- 4) Heat on a hot plate until just before the solution boils to ensure the NaCl dissolves.
- 5) Fill the flask the rest of the way to the 2000 mL mark with tap water
- 6) Fill the 20 liter contain with 18 liters of tap water. Then add the solution 2000 mL NaCl solution to the 20 L container. Store until ready to precondition columns. **note that this will be the same solution used for in regenerating each of the columns.
- 7) Once ready to precondition the 10 mL column add the 8 grams NaCl per liter solution to the constant head source on the lab bench. Make sure the valve is closed to prevent the water solution from flowing out
- 8) Place the column stand on the lab bench
- 9) Fasten the connector to the constant head source to one of the columns
- 10) Turn on the pump for the constant head source
- 11) Open the valve slightly with the bottom of the column still closed to fill the column with solution
- 12) When the column is full of solution you are ready to being to cycle 10 bed volumes or 100 mL of 8 grams NaCl per liter solution through the 10 mL bed volume
- 13) Next rinse the bed volume
- 14) First dump out any excess 8 grams NaCl per liter solution and rinse the constant head bucket with tap water
- 15) Fill the constant head source with 10 L of tap water
- 16) Cycle 4 bed volumes through each of the 4 experimental columns using the same method as above
- 17) Dump remaining tap water out of the constant head bucket into the sink
- 18) Set aside and label columns "Exp 1"
- 19) Dump the waste regeneration solution into the sink
- 20) Congratulations you have now completed preconditioning the experimental columns

PART 2: RUNNING EXPERIMENTS 1

Additional Materials:

- Stop watch
- Table 2 above you sample intervals
- Tap-Column Adaptor

- 1) Add the Synthetic Water for Experiments into the constant head source. Make sure the valves are closed.
- 2) As the experiment goes forward it is necessary to fill the constant head source to keep water in it
- 3) Fasten Experimental Column 1 to the column stand on the lab bench
- 4) Open the valve just a little bit to slowly fill experimental column with Synthetic Water for Experiments from the constant head source. Make sure the column and tubing is full of Synthetic Water for Experiments and has no air bubbles
- 5) Put the 5 gallon waste water bucket that the bottom of the column
- 6) Empty the bucket in-between after each cycle into the sink
- 7) Make sure to leave enough room to take samples between the top of the 5 gallon waste bucket and the bottom of the experimental column
- 8) You are ready to start the experiment
- 9) Open the valve
- 10) the amount of head on the constant head source correlates to a flow rate of 2.6 L per hour
- 11) Take samples every 24 minutes starting 2 minutes into the cycle for 11 samples
- 12) Set aside and label samples E1C1, E2C1... etc. for cycle 1 and E1C2, E2C2... etc. for cycle 2
- 13) After the first cycle is over (11 samples) dump the rest of the Synthetic Water for Experiments from the constant head source back into its Synthetic Water for Experiments 50 liter container
- 14) Rinse the constant head bucket with tap water
- 15) Add 10 liters of regeneration solution to the constant head source. **note the regeneration solution is the same solution used for preconditioning and was produced in Part 1 of this document
- 16) Run 10 bed volumes of regeneration solution through the Experimental Column
- 17) Rinse 3 bed volumes of tap water through the column using an adaptor that attaches to the tap water supply
- 18) Congratulations you have now completed 1 cycle
- 19) Start back at step 4 and repeat 2 more times to finish the experiment (Note that experiment 1 has 3 cycles)