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| --- | --- |
| **Job** | **Team Member** |
| Safety Manager |  |
| Materials Manager |  |
| Timer |  |
| Clean-Up Director |  |

**Background Info:**

Surface mining of oil sands allows for over % recovery of the available bitumen. In comparison, recovery of in-situ ( ) oil is approximately - %, conventional heavy oil at less than 20%, and conventional light oil at 30%. Since surface mining has a significant impact on the environment, over 80% of the oil sands will have to be mined rather than from a surface mine. This lowers recovery rates significantly because of current technological limitations. Recent advances in the bitumen extraction process have called into question the need for caustic soda (NaOH). The purpose of this lab is to test

**Materials:** as projected

**Procedure:** DAY 1

1. Don apron, safety goggles, and gloves BEFORE starting.
2. Gather materials.
3. Add 150ml distilled water to a 250ml beaker
4. Based on your group’s assignment, add either 0, 6, 12, or 18 drops of 1M/L NaOH to the 150ml water in the beaker. Use the pH strips to verify your concentration (\*Hint – test after each drop!)
   * 1. 0 drops = pH 7
     2. 6 drops = pH 9
     3. 12 drops = pH 11
     4. 18 drops = pH 12
5. Heat the water in the beaker to boiling using a hot plate
6. Place the plastic tub with oil sand onto some paper towels
7. USE TONGS to add 50ml hot water to plastic tub containing oil sand
8. Weigh wooden stirring stick = g
9. Stir with wooden stirring stick for 5 min, taking care to separate sand chunks
10. Allow mixture to settle for 2 mins. \*\*WALK AROUND ROOM AND MAKE QUALITATIVE OBSERVATIONS! (Data table on reverse)\*\*
11. Weigh plastic spoon g
12. Weigh 2 pieces of filter paper g, and put on top of 4 brown paper towels.
13. Using the plastic spoon, scrape Bitumen from top of solution and sides of container. Get as much bitumen as possible from the solution.
14. Leave filter paper, wooden stick, and plastic spoon to dry in appropriate trays.

Procedure: Day 2

1. Weigh dry bitumen-covered materials.
2. Calculate values using tables below.

|  |  |
| --- | --- |
| Equipment | Pre-Bitumen Covered  Weight in Grams |
| Filter Paper |  |
| Wooden Stir Stick |  |
| Plastic Spoon |  |
| Total Dirty Weight |  |

Calculate the weight of the Bitumen recovered

(Total dirty weight – (Filter paper + Stick + Spoon)) = g

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **# Drops of NaOH(aq)** | **Qualitative Observations** | **Initial Mass of Oil Sands** | **Mass of recovered Bitumen (g)** | **Percent by Mass of Bitumen (%)**  **(Recovered/Initial)x100** |
| **0**  **pH 7** |  | **50g** |  |  |
| **6**  **pH 9** |  | **50g** |  |  |
| **12**  **pH 11** |  | **50g** |  |  |
| **18**  **pH 12** |  | **50g** |  |  |

Wrap-up questions

1. What, if any, observable differences did you see in the remaining sand mixture when you disposed of it?
2. What effect did NaOH have on the extraction of Bitumen from Oil Sands?
3. Draw a picture of a grain of oil sand, and use it to explain water’s role in the extraction process.
4. A Pembina Institute report stated that "to produce one cubic metre (m3) of synthetic crude oil (SCO) (upgraded bitumen) in a mining operation requires about 2–4.5 m3 of water (net figures).” If 1 cubic meter = 6.28 barrels of oil, how many cubic meters of water would be required to process the US’s annual appetite of 6.85 billion barrels per year?
5. What thoughts do you have about oil sands that are different than before you did this lab?

Athabascan Oil Sands Notes