**Elimination Kinetics: Measuring the Rate and Yield of E2 Eliminations**

**Introduction**

In this particular lab experiment the main purpose is to perform E2 and/or SN2 on a variety of alkyl halides. This lab experiment would be done at room temperature. By measuring the volume of the gas produced as a product, one can calculate how much alkene is formed. This information could also be used to find the percent yield of the E2 reaction.

**Physical Data and Hazards**

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| --- | --- | --- | --- | --- | --- |
| **Chemical Formula & Name** | **Molecular Weight (g/mol)** | **Melting Point (C)** | **Boiling Point (C)** | **Density (g/cm3)** | **Hazards** |
| *Chloropropane* | 236.33 | 6.1 | 195.5 | 890 (kg.m^3) | Flammable, Irritant |
| *Bromopropane* | 122.99 | -89 | 59-61 | 1.31 g/mL | Flammable, Irritant Harmful |
| *Chlorobutane* | 92.57 | -123.1 | 78 | 0.89 | Flammable |
| *Bromobutane* | 137.02 | -112 | 99-103 | 1.2676 | Flammable, Irritant Harmful |
| *Bromoethane* | 108.97 | -120--116 | 38-39 | 1.46 g/mL | Flammable, Irritant Harmful |
| *idoethane* | 155.97 | -111 | 71-73 | 1.94 g/mL | Irritant Harmful |

*Sources: Handbook for Organic Chemistry,* ***CRC Handbook of Chemistry and Physics*** *(especially Section C: "Physical Constants of Organic Compounds" ), available at the information desk in the Science Library (in Norlin) and in the Organic Chemistry Stockroom.*

***Safety Precautions***

*You have to make sure that the apparatus is air tight!*

***Wastes***

*Organic Waste: Liquid flask residue and acetone used to clean flask*

*The water from the burets can be placed in the sink, since it is not contaminated with any organic products.*

**Procedure**

1. Prepare the apparatus
   1. Two burets, a buret clamp, a narrow gas hose, and a rubber septum from TA
   2. Make sure it is airtight!
2. Grease all the glass-on-glass joints in your reaction apparatus, except for the round bottom flask joint
3. Use keck clips to hold the joints together.
4. Make sure the reaction apparatus is inside the student fume hood
5. Connect the bottom ends of the burets together with a water hose, and make sure both the buret stopcocks are open.
6. Remove the thermometer adapter from the top of the gas collection buret. Get a beaker full of water and slowly pour it into the gas collection buret until it is reading somewhere between o and 5mL
7. In the reaction apparatus make sure the rubber septum is on the CORRECT side of the claisen adapter.
8. A substrate would be injected through the septum into the flask.
9. Insert the narrow end of the septum into the opening on the claisen adaptor.
10. Once it is airtight. Remove the round bottom flask from the apparatus and weigh out 0.700-0.750g of KOH into the flask. Record the exact mass.
11. Use a 5mL syring to measure out 2.5mL of absolute ethanol into the flask, and use an adjustable pipette to measure out exactly 150uL of water into the flask.
12. Reaatch the round bottom flask to the apparatus
13. Begin stirring and heating.
    1. About 60 should do it.
14. Prepare your alkyl halide for injection.
15. Main hood, pick up a beaker containing a vial of your substrate, a syringe, and a needle. Take the entire beaker back to your place
16. In order to find the mass of alkyl halide used, you are going to wiehg the syringe twice, once when it is full of alkyl halide, and once after it has been emptied.
17. Uncap the syringe and draw up approximately 0.1mL of substrate.
    1. Recap the syringe so it doesn’t contaminate the scale.
18. Once the liquid in your round bottom flask has been boiling for several minutes and the solid completely dissolved, your apparatus is ready to use.
19. Remove the thermometer adapter from the buret
    1. Replace it and wait for 30-60 seconds for it to come to equilibrium
    2. Slide the overflow buret down to equalize the water levels.
    3. Record the initial reading on the gas collection buret.
20. Uncap the needle and insert it through the rubber septum.
    1. Do not inject the substrate yet
21. Inject the substrate into it and start timing.
    1. Do not let the substrate run down the sides of the flaks or claisen adapter.
       1. Delays the reaction
22. Withdraw the syringe and cap it, then measure the combined weight of the empty syringe, needle and cap.
23. As the reaction preoceeds, gas will be released quickly at first and then it will slow donw.
24. Continue to equalize the water levels
25. Once it has moved as far down as possible you can start to slide the gas collection buret upwards to achieve the same purpose.
26. At 30second intervals, take a volume reading from the gas collection buret and record it in your notebook.
27. Continue to take readings until the volume remains unchanged for 3 consecutive readings.
28. Disconnect the gas hose form the claisen adapter, then raise your reaction apparatus up the ring stand and allow the round bottom flask to cool for several minutes
29. Then empty it into the rganic water and rinse it with acetone.
30. Repeat the experiment with the same substrate.
31. Put the syringe and vial back into the beaker and return the entire beaker to the hood for the next group to use. Bring the beaker containing your second substrate back to your bench and repeat the entire lab with this substrate.