**SN1 REACTIONS: CONVERSION OF *t*-AMYL ALCOHOL**

**TO *t*-AMYL CHLORIDE USING HCl**

**Required prelab readings**: McMurry Sections 12.6 – 12.9; Padias143 – 148 (simple distillation)

**Previous techniques you must understand and be able to perform**: extraction.

Synthetic Procedure:

Concentrated acid is highly corrosive, you may wish to wear gloves during this portion of the experiment. Place 2-methyl-2-butanol (100 mmol; *You must calculate the volume of t-amyl alcohol required for this experiment prior to coming to lab or you will not be allowed to begin the experiment*) into a 100 mL round bottom flask containing a stir bar. Clamp the flask above the stirrer/hot plate and carefully add concentrated hydrochloric acid (25 mL). Stir this mixture as vigorously as possible for 10 minutes, then quantitatively transfer the contents to a separatory funnel and draw off the lower aqueous layer. Wash the remaining organic layer with an equal volume of 5 % aqueous NaOH. Drain off the aqueous layer and dry the organic layer over anhydrous sodium sulfate. You will need to judge for yourself how much sodium sulfate is necessary to dry your organic phase after the washing procedure. Decant the solution into a 50 mL round bottom flask, add boiling chips and perform a simple distillation. Your prelab must have a drawing of a miniscale distillation apparatus (Figure 3-13; omit ice bath and drying tube). While setting up the simple distillation apparatus, remember to clamp securely and insert the thermometer properly. Collect the constant boiling fraction near the expected boiling point in a preweighed flask. Record the mass of t‑amyl chloride recovered.

Beilstein test:

The Beilstein test is used to confirm the presence of a halide in a compound. To perform a Beilstein test clean a piece of copper wire by holding it in a flame for 10 sec. Remember to keep the flame well away from any flammable solvents. After cooling, dip the wire into your product and then place the wire back into the flame. A green color indicates the presence of a halide. For comparison perform the Beilstein test a sample of pure starting material.

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**DATA SHEET**

|  |  |  |  |
| --- | --- | --- | --- |
| **NAME:** |  | **Section:** |  |

Overall Reaction (chemical drawing software):

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Volume of alcohol used: | |  |  | | Theo mmol product: | | |  | | | |
|  | |  |  | |  | | | |  | | |
| mmol of alcohol used: | |  |  | | Theo mass product: | |  | | | | |
|  | |  |  | |  | | | | |  | |
| Volume HCl used: |  | |  | | Mass recovered product: | | | | |  | |
|  | |  |  | |  | | | | |  | |
| mmol HCl used: |  | |  | | Moles recovered product: | | | | | |  |
|  | |  |  | |  | | | | |  | |
|  | |  |  | | % yield of product: |  | | | | | |
|  | |  |  | |  | | | | |  | |
|  | |  |  | Boiling point of recovered product: | | | | | |  | |
|  | |  |  | |  | | | | |  | |
|  | |  |  | | Literature boiling point: | | | | |  | |

Calculations: (lab notebook)

Post Lab Questions:

1. You begin with pure *(S)*-4-methoxybutan-2-ol and want to prepare *(R)*-1-methoxy-3-cholorobutane in high yield.

a. Show the reaction that would take place if you ran the reaction under the same conditions you used in this experiment.

b. Would it be a good idea to use this procedure to make *(R)*-1-methoxy-3-cholorobutane in high yield? Explain your reasoning.

2. Write the rate equation for the reaction in Question 1.

3. Which should occur faster under the conditions of this experiment: hydrolysis of *t*-butylchloride or isopropyl chloride? Explain your reasoning.

4. Show the formal step-by-step "electron-pushing" mechanism for the reaction you performed this week.

5. Provide the major product(s) for the substitution reaction below.

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  |  |  |
|  |  |  |  |
| b. |  |  |  |
|  |  |  |  |
| c. |  |  |  |
|  |  |  |  |
| d. |  |  |  |