Chemistry 260 Summer 2024

E3: Synthesis and Chemistry of Alkenes

**<<Complete this report form by inputting the information indicated by red text. Delete red text instructions before submitting (there are marks associated with doing so.>>**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Section:\_\_\_\_\_\_\_\_\_Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Abstract (3 marks; 1 for written portion, 2 for reaction scheme)**

In this experiment, <<delete this text and insert an abstract that includes a concise summary of the experiment that was performed and the methods used to characterize the product>>

The synthetic scheme of the reaction is shown below:

<<IMAGE>><<Delete this text and insert a reaction scheme showing the reaction that you performed. Include the multiple expected products and indicate which is expected to be the major product. Note that this **scheme** does not need to be balanced since you will be showing multiple products formed.>>

**Procedure and Observations**

The procedure was followed as provided in the Chem 260 lab manual.1

**Observations: (2 marks)**

<<Delete this text and insert any observations you made during the experiment. Make sure to also indicate at which stage of the experiment each observation was made. Observations worth noting include: colour changes, gas evolution, changes in solubility (such as precipitate formation), if the addition of a reagent was exo- or endothermic, etc. This section will likely be quite short>>

**Reagents and Products Tables (2 marks each)**

<<You will likely need to add more rows to these tables. Solvents in huge excess or compounds used for workup (e.g., magnesium sulfate) don’t require mole values.

**Table 1**. Reagents for the dehydration reaction.

| Compound | MW | Used | millimoles | Physical and Safety Data |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |

The limiting reagent is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Table 2**. Products of the dehydration reaction.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Compound | Physical Description | MW | Amount Isolated | moles | % yield |
| Terpineol alkene isomers |  | 136.24 g/mol |  |  |  |

**Results**

**Percent Yield: (1 mark)**

<<Delete this text and insert a % yield calculation (you can make the assumption for this calculation that everything you recovered from the distillation is alkenes, but be sure to comment in the discussion on whether this assumption is reasonable based on the characterization data you collect!>>

**TLC Results: (3 marks)**

<<Delete this text and make a note of the conditions used to record the TLC (type of plate, solvent used and visualization method(s)). Insert your TLC plate photo or to-scale drawing>>

**Table 3.** Summary of TLC results from the experiment. <<Add or remove rows to suit your data. Shading is included to try to help divide data for each lane.>>

|  |  |  |  |
| --- | --- | --- | --- |
| Lane (number from left to right) | Number of spots | Rf | Identity of compound |
| **1** |  |  |  |
|  |  |
| **2** |  |  |  |
|  |  |
| **3** |  |  |  |
|  |  |

**Rf sample calculation:**

Rf = distance travelled by spot/distance travelled by solvent front

Rf = <<Your value for spot>>/<<your value for solvent front>>

Rf =

**Results of the Gas Chromatographic Analysis (3 marks)**

**Table 4.** Summary of the GC results from the experiment. <<You will likely need to add more rows to this table>>

|  |  |  |
| --- | --- | --- |
| Component | Retention Time (minutes) | % Composition (assume equal to % area) |
|  |  |  |
|  |  |  |

The GC data is attached to this report as Appendix <<X>>.

**Results of IR Analysis: (3 marks)**

<<You will need to add more rows to this table. List all peaks between 4000 - 1500 cm-1. Only assign major characteristic peaks. Not every peak needs an assignment or a comment. Comment on whether the assigned peaks indicate the presence of product or of starting material>>

**Table 5.** Summary of the IR results from the experiment.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Starting Material | | | Product | | |
| Wavenumber (cm-1) | Strength (s/m/w) | Assignment and/or Comment | Wavenumber (cm-1) | Strength (s/m/w) | Assignment and/or Comment |
|  |  |  |  |  |  |

The IR data are attached to this report as Appendix <<Y>> for starting material and Appendix <<Z>> for product.

**Discussion:** (**16 marks**, 600 words max.)

<<Delete this text and insert your discussion. Explain the chemical significance of your results, and do not assume that the reader already knows the answers! Explain it as if you are trying to convince someone who has not seen this data before. Some prompts are included below but the amount of prompts and detail included in the prompts will decrease as the semester progresses. By the end of the term, we expect you to identify what needs to be included in the discussion section.

Include the following: Discuss the success (or failure!) of the dehydration reaction. What did the data tell you about the composition of the material you isolated? Comment on the yield and purity of your recovered material – how might you improve on this experiment if you were to repeat it?

Of the alkenes, was the distribution of products as expected? Explain why or why not with reference to what you know about the reaction mechanism (recall what you learned in 231). Drawings of the structures of the compounds and their pathways of formation might help you explain here.>>

**Conclusion: (2 marks)**

<<Delete this text and insert a conclusion. What is/are the major finding(s) or results of this experiment? Was the reaction successful? Concisely summarize what data allowed you to make this conclusion.>>

**References: (1 mark)**

1. <<insert a citation to the lab manual>>

**Appendices:**

<<Attach your gas chromatogram and IR spectra as labelled appendices.>>

**Additional Graded Components:**

**Prelab: 3 marks**

**Samples & Clean-up: 2 marks**

**Appropriate editing and formatting of the report: 2 marks**