Report for Laboratory Exercise #4

Synthesis of Tetramethylammonium Triiodide and Tetramethylammonium Pentaiodide Me_4NI_3 & Me_4NI_5

Using Microsoft Word, students are to insert responses in all highlighted areas. It is recommended that the report be completed without changing font size, column width, row width, margins and highlights. The completed report must be uploaded to the 101 CourseSpaces within 2 calendar days of the end of the scheduled lab period.

Name: _ Lab Section: _B02_ Quad _2_Date: _June 28th, 2018_

Abstract

Me_4NI_3 and Me_4NI_5 were synthesised by reacting I_2 with NMe_4I in solution with control of the reaction stoichiometry. The % yield for Me_4NI_3 was 378%, and the % yield for Me_4NI_5 was 57.5% .

Data/Results

Table 1. Experimental data and calculated values for the preparation of Me_4NI_3 and Me_4NI_5

Synthesis	Me_4NI_3	Me_4NI_5
NMe_4I (g)	0.504	0.497
I_2 (g)	0.508	1.30
actual yield (g)	4.31	1.04
theoretical yield (g)	1.14	1.81
% yield	378%	57.5 %

Algebraic Equations

a) Balanced chemical equations for formation of each of the products: _

$Me_4NI + I_2 \rightarrow Me_4NI_3$ (1:1:1)

$Me_4NI + 2I_2 \rightarrow Me_4NI_5$ (1:2:1)

b) Limiting reagent for each of the preparations _

Me_4NI_3 formation:

$Me_4NI \rightarrow 0.504\ g \times 1mol/201g = 2.51*10^{-3}$ mol

$I_2 \rightarrow 0.508\ g \times 1mol/254g = 2.00*10^{-3}$mol ←limiting reagent

Me_4NI_5 formation:

$Me_4NI \rightarrow 0.497\ g \times 1mol/201g = 2.47*10^{-3}$ mol ←limiting reagent

$2I_2 \rightarrow 1.30\ g \times 1\ mol/254g \times 1/2 = 2.56*10^{-3}$mol

c) Theoretical yield for each of the products =_

_0.504 g (Me_4NI) x 1mol (Me_4NI)/201g x 1mol (I_2)/1mol (Me_4NI_3) x 455g/ 1mol (Me_4NI_3) = 1.14 g

1.30_g (I_2) x 1mol (I_2)/254g x 1mol (Me_4NI_5)/2mol (I_2) x 709 g/ 1mol (Me_4NI_5) = 1.81 g

d) % yield of each of the products =_

Me_4NI_3: 4.31g (actual # from experiment)/ 1.14 g (calculated theoretical yield) x 100 =378% yield

Me_4NI_5: 1.04g (actual # from experiment)/ 1.81g (calculated theoretical yield) x 100 =57.5% yield

Discussion *Respond to the following:*

Discuss the meaning of the % yield and comment on the % yield observed for each of the products (max 4 lines). _

Having such a high percentage of Me_4NI_3, I assume I needed to dry my crystal longer so that the actual yield was closer to what it was probably supposed to be. Though if it was the case to be over 100% like this Me_4NI_3, there was an impurification in the sample. In contrast, Me_4NI_5 (having only 57.5%) might have had some incomplete reaction or loss of sample during the collection process.

Discuss the potential sources of impurities in the product (max 2 lines). _

The impurities in the Me_4NI_3 synthesis could be because some of the reactants were not dissolved completely, considering the amount of time (over 10 mins) struggling to dissolve all_

Conclusions

By reacting tetramethylammonium iodide (NMe_4I) with diiodide (I_2), we could create the crystals of Tetramethylammonium Triiodide (NMe_4I_3) and Tetramethylammonium Pentaiodide (NMe_4I_5) knowing the reaction stoichiometry. The % yield for NMe_4I_3 and NMe_4I_5 were 378%, and 57.5% respectively.

References

1. Reimer, M. et al, *Properties of Materials*, *Laboratory Manual, Chemistry 101*, pp. 37-41. (University of Victoria: Victoria, B.C.). **Summer 2018**. _

Feedback Summary	max.
Pre-lab quiz: Are all responses correct?	3
Laboratory Notebook: Have all data and observations been recorded?	1
Report: Are all sections completed?	1
Participation: Did the student come prepared, was time used well in lab and was student engaged in the experiment?	1
Performance evaluation: Did student follow the safety guidelines?	1
Total mark	7