

Dehydration of cyclohexanol

[Environment](#), [Water](#)



Dehydration of Cyclohexanol Introduction In this experiment cyclohexene, an alkene, was prepared by the dehydration of cyclohexanol, an alcohol, using phosphoric acid, an acid catalyst. The reaction is as follows: [pic] The dehydration of cyclohexanol was performed in a simple distillation apparatus. As cyclohexene formed, it was distilled out of the mixture.

Background Dehydration is an elimination reaction of an alcohol that takes place in the presence of an acid catalyst. In this experiment, 85% phosphoric acid was used as the acid catalyst. The alcohol dehydration required an acid catalyst and heat and the reaction was conducted in a simple distillation apparatus. Since, cyclohexene has a lower boiling point than cyclohexanol, cyclohexene can be distilled as it forms. So as the mixture was heated, cyclohexene distills out and is collected in a conical flask. Cyclohexanol, phosphoric acid, and water are left in the distilling flask because of their high boiling points. However, since a small amount of water may still appear after transferring the product from the conical flask, a drying agent is used to separate the cyclohexene and the remaining water is removed. Cyclohexene is insoluble in water and thus is not lost using a drying agent. **Experimental**

The procedure began with weighing 10.0460g of cyclohexanol which was put directly into a 100ml round bottom flask with a cork ring. Then, 3ml of 85% phosphoric acid and a few boiling chips were added to the flask. The flask was then clamped into the ring stand. A simple distillation apparatus was built and the conical flask with a side arm was placed into an ice bath. Dr. McCloskey checked the apparatus for accuracy before the water and heat were turned on. The variac, which controlled the heat applied, was turned to 6 and later increased to 8. The temperature was a little higher than 83

degrees Celsius. Cyclohexene was collected via pipet from the conical flask and put into an empty flask until the distillation flask contents became thick and yellow. A piece of wrap was used to cover the flask and make it air tight. The temperature dropped when the contents stopped coming over to the conical flask. Dr. McCloskey added a drying agent to rid the cyclohexene collected of any water. The remaining water was removed via pipet. The cyclohexene collected was put into an empty flask that weighed 41.1038g.

Results To calculate the percent recovery of the product a series of calculations took place first. First, calculation was the moles of cyclohexanol started with. There was 10.0460g of cyclohexanol obtained for this experiment which was divided by the 100.16g/mol cyclohexanol which equals 0.1003mol cyclohexanol. Since cyclohexanol and cyclohexene are a 1:1 mol ratio, it was used to calculate the theoretical mass of cyclohexene. So, 0.1003mol cyclohexanol equals 0.1003mol cyclohexene multiplied by 82.14g cyclohexene which equaled 8.239g cyclohexene. The actual mass of cyclohexene collected from the experiment was 5.9929g cyclohexene. The percent yield was 5.9929g divided by 8.239g multiplied by 100 which equaled 72.7382%.

Conclusion The dehydration of cyclohexanol into cyclohexene using 85% phosphoric acid is a typical dehydration of an alcohol using an acid catalyst to form an alkene reaction. The simple distillation apparatus was sufficient to use to get desired results. The percent recovery of the product was 72.7382% which is very good for an alkene product.