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# Making Esters Lab

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### Honors Project: Making Esters

Alcohols and carboxyl groups are attached to form esters. Esters are functional groups with an oxygen double bonded to a carbon as well as another oxygen attached to the same carbon. When you mix an alcohol and carboxyl group like I did in this experiment, your product is an ester and water. My goal was to make a recognizable scent by mixing an alcohol and an acid.

#### Trial #1 – Strawberry – April 17<sup>th</sup>, 2018

I mixed 0.03 grams of Trans-cinnamic acid, 0.5 ml of Methanol, and 4 drops of sulfuric acid in a 100 ml round bottom flask. I added a magnetic stirrer to the flask and turned the stirring speed up to 200 rpm. I covered the flask with foil and attached the flask to a stand using metal clamps. I set up the flask over a hot plate and started the temperature at 2:00pm and heated it for an hour. I also added 5 ml of DI water to the flask. We increased the stir speed to 300 rpm and increased the temperature to 80 degrees Celsius after very little change had occurred. After 40 minutes had passed, we increased the temperature to 100 degrees Celsius. The solution smelled sweet, but not super strong of strawberry scent. My mixture was also super grainy because my Trans-cinnamic acid did not dissolve.

#### Trial #2 – Strawberry – April 24<sup>th</sup>, 2018

I mixed 0.03 grams of Trans-cinnamic acid, 0.5 ml of Methanol, and 4 drops of sulfuric acid in a 100 ml round bottom flask. I added a magnetic stirrer to the flask and attached the flask to the stand using a metal clamp. I then set the flask so it was slightly above a hot plate and turned the stirring speed up to 300 rpm. I corked the flask with a paper towel so the condensation would stay inside the flask. I started with the temperature at 100 degrees Celsius instead of increasing the temperature like the first trial. The solution smelled sweet and slightly more like artificial strawberry scent after heating for 1 hour. The smell was not identifiable to those who did not know what I was making, but everyone agreed it smelled fruity. We didn't add DI water to this flask and it made the solution more concentrated and not grainy.

#### Trial #1 – Cinnamon

I mixed 0.5 ml of Ethanol with 0.03 grams of Trans-cinnamic acid, and 4 drops of Sulfuric acid in a 25 ml round bottom flask. We added a magnetic stirrer to the flask, put it over a heating plate, and turned on the temperature to 100 degrees Celsius. We then increased the stirring

speed to 300 rpm and kept it constant throughout the hour long heating process. I did not allow the flask to touch the heating plate, but instead attached it to the stand using metal clamps and had it slightly above the heating plate. My liquid this time was slightly clear and merky white. The mixture smelled less sweet than the strawberry mixtures in the first two trials, but had no hint of Cinnamon.

I heated the same mixture on April 27<sup>th</sup>, 2018 at 200 degrees Celsius in hopes to get a different outcome. A lot of concentration droplets formed on the inside sides of the flask, but very little liquid stayed in the bottom of the flask. The liquid became light brown and the scent did not really change.

#### Trial #2 – Cinnamon

I mixed 0.5 ml of Ethanol with 0.03 grams of Tran-cinnamic acid, and 12 drops of Sulfuric acid in a 100 ml round bottom flask. I attached the flask to a stand using metal clamps, set it up above a heating plate, added a magnetic stirrer, and increased the temperature to 200 degrees Celsius. I kept the stirring speed constant at 300 rpm. I corked the flask with a paper towel and let it heat for 1 hour. More condensation formed on the inside of the flask than the first two trials. Condensation formed on the inside of the flask at the beginning of the time. After half of my time was up, vapors started to form in the flask. Since I used a bigger round bottom flask this could have allowed more room for vapors to form compared to the other trials. Although I did not get a scent of cinnamon, this trial definitely smelled stronger and more like chemicals and alcohol than trial one. The strong chemical scent could be attributed to the 8 extra drops of sulfuric acid that were added as a variable during this trial. My liquid ended up being a light brown color after the hour was up.

#### Trial #1 – Wintergreen

I mixed 0.03 grams of salicylic acid with 0.5 ml of Methanol, and 4 drops of sulfuric acid in a round bottom flask. I again attached the round bottom flask to a stand using metal clamps and allowed the flask to rest just above the hot plate. I added a magnetic stirrer, increased the temperature to 100 degrees Celsius, and increased the stir speed to 300 rpm. I started this trial at 1:59pm. By 2:22pm, I could already smell the scent of wintergreen. At 2:34pm, the scent of wintergreen was still prominent and strong. It smelled like life saver mints. There was a moist grainy mixture at the bottom of the round bottom flask. At 3:00pm, I added 1 ml of DI water. The DI water helped dissolve more of the salicylic acid so the extract was not as grainy. In the end of this trial, the smell of wintergreen was still prominent and the mixture was fairly clear.

Overall, my wintergreen had the best results for creating an ester. Different amounts of my chemicals might have changed the outcome of my scents for strawberry and cinnamon. However, for a trial and error experiment, I would say my scents had some success. If I were to do this experiment over, I would work to do more research on understanding the ratio of chemicals needed to make certain scents. I enjoyed the trial and error aspect of being able to mix a few chemicals together to see if my scent would be successful or not. Even though I was

only successful 20% of the time, I did get an idea as to how to make a sweeter scent compared to a little more bitter or chemical scent.