Experiment 7 “Dehydration”

The IR spectra had about 3 peaks at 2834, 2855, and 2922 cm-1 which correspond to Csp3-H groups and one peak at 3001 cm-1 which corresponds to Csp2-H groups. This result is expected because each isomer only contains sp2 and sp3 carbons bonded to hydrogens. The GC spectra has peaks at retention times of 4.4 (a), 4.7 (b), 4.81(c), and 6.73(d). Comparing these results to the sample results, (a) corresponds to methelenecyclohexane, (b) corresponds to 1-methelcyclohexene, (c) corresponds to ethylidenecyclopentane, and (d) corresponds to the starting material: 2-methylcyclohexanol. (b) was the peak with the largest area so 1-methelcyclohexene is the major product.

The IR spectra for the starting material only has peaks correlating to Csp3-H groups and an OH stretch. The IR spectra for the product has similar peaks for Csp3-H groups but instead of a peak for the OH stretch it has a peak for the Csp2-Hgroups or the alkenes. Even though there was a peak corresponding to the starting material in the GC spectra, it has a very small area compared to the other products. This suggests that our product was pure but there was some starting material mixed with the product.

It was hypothesized that the most stable product would follow Zaitsev’s rule and be the isomer with the most substituted alkene which is the 1-methelcyclohexene. 1-methelcyclohexene shows on the GC spectra with the largest peak with a product ratio of 84.8% so the results match the prediction. The next most stable isomer would be the ethylidenecyclopentane with a product ratio of 7.96%. This again matches Zaitsev’s rule because the alkene is just as substituted as the 1-methelcyclohexene but it has a 5 carbon ring rather than a 6 carbon ring which is not as stable in this case because of the steric strain. The next most stable isomer was methelenecyclohexane which has a less substituted alkene and a product ratio of 6.84%. 3-methelcyclohexene did not appear on the GC spectra. Zaitsev’s rule applies to this experiment because it’s an elimination reaction so the products have an alkene.

When adding THF and pyridinium tribromide to the product, the solution turned yellow-orange for a few seconds before returning clear. This was done twice and after the second time a white precipitate was observed. This precipitate was possibly due to some starting material mixed with the product.