Diels-Alder Reaction In Water

The Diels-Alder reaction is an important carbon-carbon bond forming reaction. In this reaction a diene (a hydrocarbon containing two double bonds) reacts with a dienophile (a compound containing a double bond). The result of this cycloaddition is an adduct. The adduct is a combination of both the diene and the dienophile but the dienophile component of the product will not have the double bond it had as a reagent. The electrons from the double bond on the dienophile flow to the diene as the two compounds become one. The rate of Diels-Alder reactions can be enhanced by using Lewis acid catalysts or increasing pressure and or temperature.

This experiment is carried out using anthracene-9-methanol (diene) and N-methylmaleimide (dienophile) and water. The high cohesive energy density of water and hydrophobic interactions between water and anthracene-9-methanol also serve to increase the rate of the reaction.

Reaction

The reaction scheme is as follows:

Green Lessons

The use of water as a solvent also obeys the Principle of Green Chemistry which encourages the use of safe solvents. It also addresses the issue of waste. If this case the water will not be reused. It is safe to dispose of it in the drain with copious

Summary

The laboratory experiments discussed were researched to determine if they would be suitable for students to perform. They can be added to the Sophomore Organic Laboratory curriculum. Students can carry them out with ease. Safe chemical and solvent use, maximizing atom economy, waste and pollution reduction are valently addressed. Both of these experiments enhance the students’ understanding of organic chemistry.