Elimination-Addition Mechanism

Transcript

00:00:00:00 - 00:00:07:22
Dr.Jessie Key: Hello again, Dr. Jessie Key here. In this video, you will be exploring the Elimination-Addition Mechanism.

00:00:07:22 - 00:00:37:24
Dr.Jessie Key: Elimination-addition reactions occur via a four-step reaction mechanism, proton transfer, loss of leaving group, nucleophilic attack, and a second proton transfer. Let's push some arrows and see how this mechanism occurs: In this example, our substrate is 4-chlorotoluene, and the nucleophile is amide ion. In the first step, a proton transfer occurs where the nucleophile acts as a base to remove a proton at the position ortho to the leaving group.

00:00:40:60 - 00:01:15:60
Dr.Jessie Key: The arrow starts at the lone pair of the amide ion nitrogen to extract the proton from the ortho position. This causes the sigma bond electrons to form a new lone pair and a formal negative charge on the carbon beside the leaving group. Next, the newly formed lone pair forms a pi bond between the ortho carbon and the carbon-bearing the leaving group, which causes the carbon-chlorine sigma bond to break and those electrons go onto the chlorine atom to eject it as the leaving group, chloride.

00:01:22:74 - 00:02:15:27
Dr.Jessie Key: The benzyne intermediate is now formed and can readily undergo nucleophilic attack from the amide ion at either of the two benzine carbons, 1 or 2. Starting at the lone pair of the amide ion, an arrow is drawn to one of the benzine carbons, which causes one of the benzyne pi bonds to move to form a lone pair on the other benzyne carbon. The final step features a proton transfer, starting at the newly formed lone pair, the arrow is drawn to form a new sigma bond to one of the protons of ammonia.

00:02:15:27 - 00:02:34:59
Dr.Jessie Key: Then each sigma bond breaks, and those electrons go the nitrogen atom as a lone pair. As a result of this elimination addition, both 4-methylaniline and 3-methylaniline are formed as products.