TRU
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Example of Nucleophilic Addition

Transcript

Instructor: Brett McCollum

00:00:00:00 - 00:00:45:54
Instructor: In this video, we're going to explain how we can engage in electrophilic addition. We're going to look at this alkene here for our reaction. Because these are two carbon atoms and there's no electron negativity difference between them, neither is going to serve as a region of electron deficiency to have nucleophilic attack. Rather, the pi bond is going to serve as the source of electron density for our chemical reaction. If this is going to be our nucleophile, we need to see what is going to be the electrophile and receive that electron density.

00:00:45:54 - 00:01:36:72
Instructor: Well, there's only one other thing left in our reaction, and that's hydrogen chloride. The delta plus delta minus here, the hydrogen is partially positively charged, the chlorine is partially negatively charged so that hydrogen is going to receive the electron density forming a new chemical bond. We can draw that with the electrons from that double bond abstracting the proton. Because the proton can only have one chemical bond to it, that's going to break this bond moving the electron density onto the chlorine to form the chloride ion. Notice that I drew this curviero starting from the middle of the double bond, not on either carbon.

00:01:36:72 - 00:02:29:13
Instructor: We want to represent that is the pi electrons that are moving. When we do this though, let's see what we end up forming. We have our compound and the chloride ion, and one of these two carbons gained the bond to the hydrogen, but the other carbon lost the pi electrons, and as a result, became positively charged, and we can draw that formal charge on it. But which carbon is going to hold that positive charge? We go back here and we look, if it had been this carbon that gained the proton, then the other carbon would have the formal charge right here.

00:02:29:13 - 00:03:13:42
Instructor: That carbon is secondary, that would generate a secondary carbocation. On the other hand, if this carbon formed the new bond with a hydrogen, then the positive charge

would be over here, and that's a tertiary carbocation that would form. Since we know that the tertiary carbocation is more stable than the secondary, this is where our formal charge is located. If we want, we can show that new bond to the hydrogen that has been transferred from hydrogen chloride. Here's our reaction intermediate.

00:03:13:42 - 00:03:52:90
Instructor: We need to stabilize it now. To do that, look at what else is in the system, and we have that chloride. We can draw the electron pair from chloride, attacking our carbocation and generating our final product. If we want, we could still show that other hydrogen right there. What is this reaction done?

00:03:52:90 - 00:04:22:53
Instructor: It's taken an alkene and transformed it into a hydrogen era. I'm going to say that again. What is this reaction done? It's transformed an alkene into a halogenated hydrocarbon, where we've taken HCL and we've put it across that double bond. In this case, no stereochemical center formed, so we don't need to worry about that.

00:04:22:53 - 00:05:09:91
Instructor: This is our major product. Let's draw the minor product because that secondary carbocation is still possible to form, just as a higher energy intermediate species, and so the rate of its formation will be lower. But if that intermediate did form and we had the positive charge there, we would get a product where the chlorine had gone onto the other carbon of the double bond, and the hydrogen would be here, and we can note that this is the minor product versus the major product.