

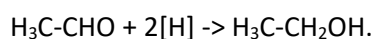
## Organic chemistry: reduction of aldehyde to alcohol

The reduction of an aldehyde to an alcohol is carried out using lithium tetrahydridoaluminate or sodium tetrahydridoborate. Usually the reducing agent is abbreviated to [H].

Aldehyde + [H] → alcohol.

But why is it a reduction?

Usually at A-level you are taught to look at the average oxidation number on carbon in an organic compound. For example, take the reaction



On the reactant side, the oxidation numbers on ethanal are:

$$\text{H} = +1 \text{ (x4)}$$

$$\text{O} = -2$$

The total is +2.

So the oxidation numbers on carbon must add up to -2. Let's take the average (divide by 2 as there are two carbon atoms), and we end up with an oxidation number of -1.

On the product side, the oxidation numbers on ethanol are:

$$\text{H} = +1 \text{ (x6)}$$

$$\text{O} = -2$$

The total is +4.

So the oxidation numbers on carbon must add up to -4. Again, let's take the average, and the oxidation number of carbon is -2.

As the oxidation number has decreased, this is a reduction.

Instead of looking at the average oxidation number on carbon, you may look at the carbons one at a time. You will find that the oxidation number on the carbon bonded to oxygen decreases, again showing that this is a reduction.

