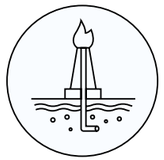

White

This is the natural hydrogen that exists in the environment. It is mostly found in layers of rock deep in the earth. It can be extracted with **hydraulic fracturing or thermal fracking**.

CO_2-neutral: No
Thermal fracking is only CO_2-neutral if renewable energy is exclusively used in the process.

Yellow

Here the electric current for the electrolysis comes from the **mix of power sources** available today.

CO_2-neutral: No
Since the global electric power mix was only about 30% renewable in 2023, it is not (yet) carbon-neutral.

Orange

Biomass is used for the production of this type of hydrogen. The process can take place in two ways. Either by heating the biomass and then filtering the hydrogen out of the resulting gases. Or with electrolysis, with the electricity coming solely from waste incineration facilities.

CO_2-neutral: No
CO_2 is one of the gases released as biomass is incinerated.

Purple

The hydrogen is extracted with electrolysis. Electricity from **nuclear power** is exclusively used in this case.

CO_2-neutral: No
While the production with nuclear power is CO_2-neutral, carbon dioxide is emitted over the lifecycle of nuclear electric power, in the mining of uranium or the processing of nuclear fuel, for example.

Green

The electricity for the electrolysis comes exclusively from **renewable energy sources** such as photovoltaics and wind energy.

CO_2-neutral: Yes
The hydrogen is only produced using a CO_2-neutral and environmentally friendly process.

Turquoise

Methane is used instead of water in the production of this type of hydrogen. Methane is broken down into solid carbon and hydrogen with methane pyrolysis.

CO_2-neutral: Yes
Solid carbon is produced instead of CO_2. The material can then be reused.

Blue

This hydrogen is produced with the steam reformation of **natural gas**. The methane reacts with water vapor.

CO_2-neutral: No.
The resulting CO_2 is not released into the atmosphere but rather compressed underground.

Brown

To produce this kind of hydrogen, **brown coal** is transformed into a synthetic gas under high temperatures and controlled oxygen input.

CO_2-neutral: No
The synthetic gas mainly consists of H_2 and CO_2.

Gray

This type of hydrogen is extracted from **natural gas**. Using steam reformation, methane is transformed into hydrogen and carbon dioxide. This is how most hydrogen is produced worldwide.

CO_2-neutral: No
The ratio of hydrogen to carbon dioxide is 1:10 in natural gas, mirroring the proportion of the hydrogen that is generated and the CO_2 that is released.

Black

Much like brown hydrogen, coal is the base material for the production of hydrogen. Instead of brown coal, **hard coal** is used here. The coal is gasified and broken down into hydrogen and carbon monoxide.

CO_2-neutral: No
As is the case with brown hydrogen, this process releases substantial quantities of CO_2.

The Hydrogen Rainbow

All hydrogen is not the same. Although it is colorless in its natural form, we differentiate it into separate color classes based on its mode of production. Whether it is green, yellow or gray, we explain what it stands for.