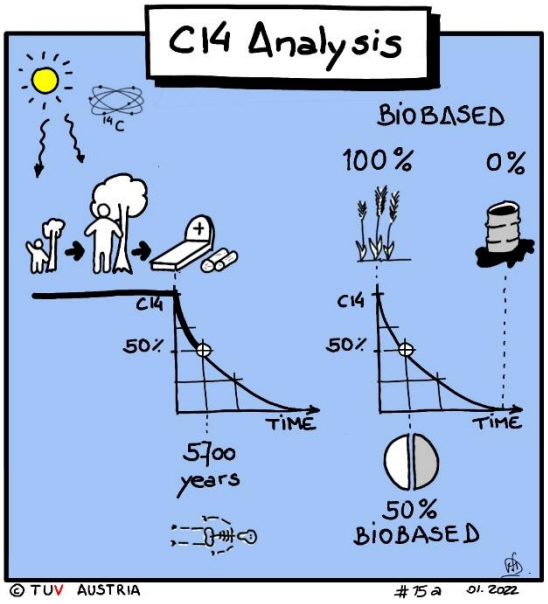
15 – C14 analysis



I have, in several previous sketches, referred to carbon 14 analysis. But how does it work?

All living organisms are constantly exchanging with their environment, either by absorbing CO2 directly from the atmosphere or by ingesting it from other organisms that have also absorbed it.

In the atmosphere, carbon exists in different forms called isotopes.
The unstable C14 isotope is generated by cosmic rays in the upper atmosphere. Weakly radioactive, it is naturally present in all living organisms (plants, animals, humans) at a very low, but identical and constant concentration of 1.2.10-12% (1 per thousand billion).

At this concentration, the degree of (radio)activity of C14 is therefore considered equal to 100%.

When an organism dies, it no longer exchanges with its environment and therefore no longer absorbs C14. Its carbon-14 isotope content then starts to decrease at a well-known rate (by half every 5700 years or so).

By measuring the C14 activity of the remains of an ancient living organism, it is possible to determine its age (how long it has been dead).

Thus, a linen fabric with a C14 activity of 50% can be dated to about 5700 years ago (the time of harvest, not necessarily the date the fabric was made).

The same method can be used to determine the bio-based carbon content of a man-made product.

Indeed, we know that freshly harvested plants have a C14 activity of 100%.
Whereas oil, derived from plants that died millions of years ago, will have no activity at all.

By analysing the C14 activity of a man-made product, it will be possible to determine the proportion of recent carbon (100% activity) and that of fossil carbon (0% activity).

For instance, an activity rate of 50% leads to the conclusion that 50% of the carbon is recent/contemporary and 50% of the carbon is fossil.
The bio-based carbon content is therefore 50%.