



Autrans – Vercors Nature Reserve  
1 February 2007

### Wax molecules

#### What are Cera, Wax, and Paraffin?

**Introduction:** In this article you'll discover the reason why hot scraping doesn't change the wax molecule as well as the difference between basic paraffin and Cera and our research approach in producing more resistant Cera dedicated to long-distance runners. But first let's do a quick revision of basic chemical concepts.

#### What is Matter?

Matter can be characterised as it occupies a volume, has mass and properties connected to its physical states: solid, liquid and gas.

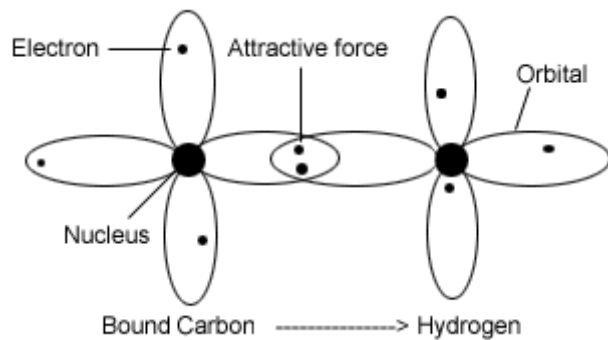
If matter includes only identical atoms, it is said to be an element (carbon, hydrogen, aluminium, iron, oxygen, fluorine...).

If matter consists of different combined elements, it is said to be a molecule, which in turn can be combined to form other substances.

Thus, by definition wax is a "compound" of a number of molecules (bound atoms), which are long sequences of carbon atoms bound to hydrogen atoms. Each of these molecules plays an important role in general wax characteristics.

Another important fact is **the molecular structure**.

An atom consists of a nucleus containing neutrons and protons, around which circulate negative electrons. The concept of an electron and its charge will enable you to understand all the rest, especially **the way wax changes its state** (from solid to liquid and visa versa), and learn the reason why the basic molecule remains unchanged.



### What are the possible changes in the state of matter?

A solid can melt, a liquid can evaporate or solidify, a gas can condensate in liquid or even cool down and compress to a solid. As a general rule, solid matter melts when affected by heat.

In solid state atoms and molecules are very close to each other and this stimulates forces of interaction.

When solid wax is heated, atoms start to vibrate and move, shifting faster and faster as the temperature rises. At the melting point all interactions are broken. Molecules become much more mobile relative to each other. During this phase molecules start to trickle down and diffuse with any other material.

### Do molecules modify with the change of matter state?

**NO**, matter state changes don't modify the nature of molecules, they only influence their organisation. Molecules can revert to their initial state and change their state this way several times without any consequence to their characteristics. So, hot scraping just after wax application by iron is simply a mechanical way of applying waxes to clean structures. Whether you let wax cool down or not in no way influences its composition!

### What happens when wax starts to smoke?

When iron is too hot, you can partly burn wax. Overheated wax molecules pass to a liquid state and then to gas. Atom ties inside the molecule start to break and form bonds with the air oxygen. This reaction creates two different chemical products, water (vapour) and carbon dioxide (gas). This is a one-way process, new substances cannot be transformed back to wax.

### CH-waxes without additives

This explication is only valid for CH waxes in blocks without additives.

### LF and HF waxes

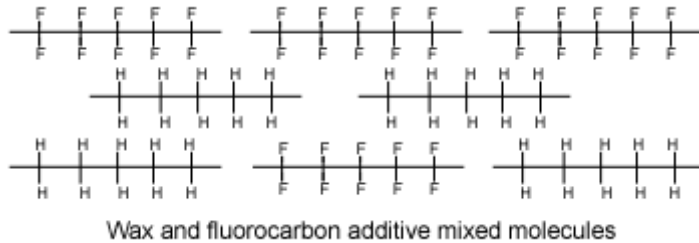
As for LF and HF waxes that include PTFE polymers (called fluorine), when you exceed the "PTFE" melting point, that is 320°C, this polymer starts to decompose and finally transforms into vapour and forms bonds with oxygen. This leads to the creation of a highly toxic gaseous product. The maximum temperature of the iron is 180°C, so you shouldn't worry. The only way to overheat these waxes is to expose them to high temperatures of flames, heat guns or cigarette smoke...

### Cera

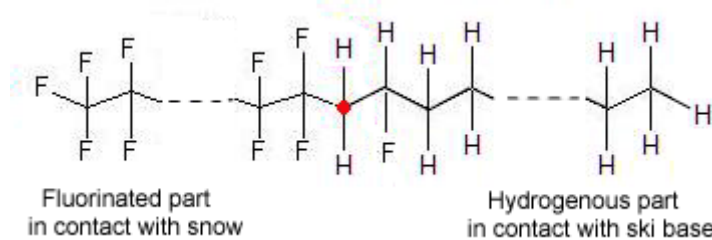
Once you grasped the first part of our article where we explain wax composition and

its molecular structure (CH, LF and HF), you can easily understand the composition of the Cera molecule.

If block wax is visibly homogeneous, this is partly due to affinity between contained hydrogenous molecules.



Cera, on the contrary, results from a synthesis of two or more different molecules' bonding. Thus, one or several hydrogenous molecules are soldered to the fluorinated chain. Theoretically, chemical bonds are strong, though sometimes overheating can lead to their decomposition. Any chain level can be subject to bond breaks. And any molecule transformed into gas is hazardous to health. That is why you should imperatively wear a panoramic gas mask protector (covering your face, nose and eyes) and special gloves.



As for our CeraMax molecule, we have developed the hydrogenous part using our unique device for wax and Cera wear control. By reorganising and modifying its length, we have given preference to its resistance to abrasion and its high base adhesive power, while maintaining a high level in speed and acceleration characteristics. This relation SPEED/RESISTANCE, which we propose, has allowed us to be the only brand offering final products for racing with a longevity guaranty. Their application remains the same, though a bit longer brushing claims special attention. Before transforming into a liquid the product passes from a solid state to half-solid, so to-and-fro motions of the iron enable a better saturation of your ski base structures.

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