



Wondering Whether to Choose Wax- or Oil-Based Pencils?

Deborah Maklowski, CPSA, CPX • President

The answer is: **YES**

Pepsi or Coke? Windows or Mac? MP3 or vinyl? Uber or Lyft? As consumers we are faced with seemingly endless choices.

The question of which product to choose often leads to equally endless debates and strong loyalties. In the colored pencil universe, the most basic “which” question for years has been “oil or wax?”

But that, as it turns out, is the wrong question to ask.

Nearly all of us are used to defining dry (non-water-soluble) colored pencils as either “wax-based” or “oil-based.” As a result, we share a flawed inference that a pencil can be only one or the other, and some of us have developed strong feelings about which is better.

It’s time to place the oil/wax debate in its proper perspective through a more accurate understanding of the chemistry behind the making of colored pencils. So, we reached out to three industry experts and asked them to explain the true distinction, if any, between “oil-based” and “wax-based” colored pencils.

What the experts say

Barbara Murray, Technical Manager at the Cumberland Pencil Company/Derwent, told us, “I honestly believe that the oil/wax-based debate has arisen mainly through translation problems.” She says, “I’ve held the view for a long time that the word ‘oil’ is used in translation but, in actual fact, the products use wax.”

Dr. Gerhard Lugert, corporate R&D chemist and Director of Development Chemistry at Faber-Castell, agrees, saying, “The term ‘oil-based’ is misleading.”

Our third expert, Eric Vitus, chemist and Fine Arts Manager at Caran d’Ache, said that this issue is more about translation, semantics, and marketing than about

“I was never fond of grouping colored pencils into ‘wax-based’ and ‘oil-based,’ since this division is neither accurate nor descriptive.”

—Alyona Nickelsen, colored pencil artist and the author of *Colored Pencil Painting Portraits*, Watson-Guption, June, 2017

chemistry. In speaking about pencils marketed as “oil-based,” he says “I would be very astonished if they use liquid oil.”

The point about the melting point ...

The distinction between liquid and solid is at the core (you should pardon the expression) of this issue.

Murray tells us she does not believe it’s possible to make what we all consider a colored pencil without the use of **both** waxes and oils. She goes on to explain, “Chemically, waxes and oils are from the same family. They are all lipids with carbon-hydrogen-oxygen [CHO] bonds, and the main difference is the CHO chain lengths.” It is those CHO chain lengths that determine whether the lipid is a wax—solid at room temperature—or an oil—generally liquid at room temperature.

Therefore, rather than focusing on the misleading terms “wax” and “oil,” Murray believes **the focus should be on a lipid’s melting point.**

She says, “Both waxes and oils have variants that melt at different temperatures, so it’s possible to blend them together to get a different hardness in pencils.” Using harder waxes with higher melting points in the blend makes the pencil core harder; waxes with lower melting points create softer cores.

“It’s all about the blend.”

Murray sums it up by saying, “It’s all about the blend.” Every manufacturer, she says, in developing each of its individual pencil lines, strives to find a perfect mixture of pigments, additives, and fillers to be combined with just the right blend of different waxes with different melting points.

The goal is to develop a mixture that balances a high pigment load with optimum wax absorption so that the pencil has both a strong point and an excellent lay-down of color.

Both Eric Vitus and Dr. Lugert agree that all non-water-soluble pencils are made with a blend of both waxes and oils—that is, lipids with a range of melting points.

Dr. Lugert notes that, while the addition of a very small amount of liquid oil to a pencil core mixture is possible, too much oil would make the pencil core too soft to use, cause oil migration



onto the surface of the core, and reduce the core's temperature stability and mechanical stability.

How it's done

To explain that more clearly, both experts described for us the two most common colored-pencil-manufacturing processes: a "non-direct" (also called "post-waxed") process and a "direct" (or "pre-waxed") process.

Non-direct / post-waxed

In this process, pigments, inorganic fillers, and additives are bound together, mixed with water to achieve the desired consistency, and then extruded as pencil cores, which are set aside to dry.

Once dry, the cores are soaked for several hours in a high-temperature (176°–212° F) melt of various waxes and waxy substances, such as hydrogenated castor oil. This allows the waxes to impregnate the cores. Although liquid at those high temperatures, the mixture, like a wax, is solid at room temperature. Faber-Castell Polychromos pencils are made this way, as are Derwent colored pencils and all Caran d'Ache pencils except Luminance.

Hydrogenated Oil

Hydrogenation is a process in which hydrogen is added to an oil to increase its stability and raise its melting point so that it becomes solid at room temperature.

Direct / pre-waxed

This process eliminates the melt. Instead, hydrogenated castor oil and other waxes, along with a cellulose binder like natural organic gum, are added directly to the mixture of pigments, fillers, and additives. This mixture is extruded as pencil cores and then dried and cured before being used. Caran d'Ache Luminance pencils are made with this process.

The bottom line

So how did we get to thinking that a pencil is either wax-based or oil-based?

Semantics played a part, no doubt. Dr. Lugert thinks the liquid nature of the melt used in the non-direct/post-waxed process may have led to the confusion

Perhaps, [Vitus] suggests, it's that difference in consistency that artists erroneously attribute to the presence of liquid oil in a pencil.

about the meaning of "oil-based." Vitus points to the presence of hydrogenated castor oil which, despite its name, behaves like a wax at room temperature. He believes that the use of hydrogenated castor oil in making Luminance and Pablo pencils has led to the mischaracterization of those pencils as "oil-based." He states emphatically, however, that none of the Caran d'Ache pencils should be described as "oil-based," because no liquid oil is used in their manufacture.

Then there's the way manufacturers identify their pencil lines. Vitus says that, when Caran d'Ache has in the past described their pencils using the word "oil," it was not because there's a chemical reason to do so, but instead to position the brand correctly among the many varieties of pencils available. Again, as Murray says, it's about the blend of waxes

No, we don't kill beavers

Eric Vitus of Caran d'Ache says that hydrogenated castor oil, also used in cosmetics, is a good example of how manufacturers can run into translation troubles when labeling their products for foreign markets.

"The [standard] international name is 'castor oil.' The problem is that 'castor' in French is a beaver. If you buy cosmetic products in France, it [will say] 'castor oil' on labels (and not 'huile de ricin' [the French term for castor oil]). So, many French-speaking people are horrified because they think that we kill beavers to make oil."

Videos for the still curious

For a video showing the non-direct/post-wax process at Derwent, see:

<https://www.youtube.com/watch?v=b8Tmz6crROo>



A non-direct process is also used by Faber-Castell. See their video about both graphite and colored pencil production at:

<https://www.youtube.com/watch?v=aPb-sIJH9Vs>



used: some are "oilier," some more like soft or hard waxes. The blend of waxes used in a given pencil will fall somewhere along that continuum. Pencils with an oilier blend of waxes may indeed be described as "oil" pencils on the box, but that does not mean that any liquid oil was used in their manufacture.

Vitus wraps it up by saying that the debate of wax vs. oil is in fact the wrong one. Instead, he believes that the real distinction to be made is whether a pencil was manufactured using the non-direct/post-waxed or the direct/pre-waxed process. "For technical reasons, direct [pencil cores] contain more wax... they are softer, smoother." Perhaps, he suggests, it's that difference in consistency that artists erroneously attribute to the presence of liquid oil in a pencil.

So, while you ponder all that, we suggest you sit down on your chair (or stool), fire up your Mac (or PC) to print your photo, set the mood with Amazon Music (or Pandora or Spotify), grab a Coke (or a Pepsi or maybe a latte), and get set to create your new masterpiece with your oil AND wax pencils. See? One less choice to make...

You're welcome.