DYES, PIGMENTS AND UV STABILIZERS

Dear Dr. Vela:

We are facing some problems with solid dark colored candles because of their color. All our candles are hand poured in our moulds. To color the candles we do not color overdip the core, because we prefer the entire candle in one solid color and for some candles it is impossible to color overdip because of their shape. The problem today is that some dark colored candles burn and some do not burn. Could you help us with some ideas or solutions how to solve this problem?

Dear Member:

The problem here would appear is that you are using colors containing some inorganic pigments rather than 100% organic dyes. Inorganic compounds give rise to incomplete combustion or in the worst cases almost no combustion at all. This can be associated with the formation of dark fines in the burn pool, mushrooming of the wick and poor burn performance such as flame height reducing during burn, smaller than expected flame height or in some cases no burn. First, you need to ensure that the dark colors that you are currently using are organic dyes (not pigments) and, that they are free from extenders such as titanium dioxide, carbon black or other inorganic compounds. Second, darker colored candles always require a larger wick that light or pastel colored candles to burn correctly therefore, test with new larger wicks.

Dear Dr. Vela:

What do you recommend to avoid the color migration or spotting that is produced on the candle packaging film that results in the candle loosing its original color? Also would like to know if some vegetable waxes can be used at 100% and the color be white.

Dear member:

Color spotting on the candle can be caused by incomplete dispersion of the color through the molten wax which in turn can be the result of a color containing oil insoluble pigment rather than soluble dye. Loss of color could be also caused by UV degradation of the color or if there is stearic acid present in the formulation by acid attack on the color changing its structure and so changing color.

Vegetable wax suppliers should be able to give product recommendations (and guidance as to whether can be used 100%) based on the type of candle to be produced.
There are two main types of vegetable wax which are the fatty acids (commonly referred to as stearic acid) and the triglycerides (otherwise known as stearines). Only the fatty acids give a pure white product with the triglycerides at best described as slightly off white.

Molding - As vegetable waxes are more brittle and have less shrinkage than paraffin wax then molded candles using 100% vegetable wax tend to crack easier and are harder to de-mould than those using 100% paraffin wax. However this does not mean it is not possible although a lot will depend on the type / size of candle and process used as well as the type of vegetable wax used. In general 100% vegetable systems are used for molding smaller diameter candles.

Pressing – It is possible to press 100% vegetable wax however the candle will not have the same mechanical strength / toughness as candles pressed from paraffin or paraffin / vegetable blends. Machine speed may also need to be reduced to run correctly.

Extrusion – It is not possible to extrude 100% vegetable wax candles and in fact extrusion blends still require a relatively high proportion of paraffin wax.

Filling – Vegetable waxes can be used 100% to fill container candles although the addition of a small amount of microcrystalline wax (3-5%) can improve performance in terms of surface smoothness and fragrance retention.

Dear member:

Color migration towards the packaging film in wrapped candles is a common problem. This is caused by a reaction between the raw materials used in creating the packaging film with the dyes, fragrances and stearic acid used alone or in combination in candle manufacturing. The packaging film which is in contact with the candle surface begins to plasticize and this causes the color migration to the packaging and the discoloration of the candle. Although it is not possible to fully eliminate this effect completely, there are some changes you can do to reduce or postpone this problem.

There are packaging films specifically designed to wrap candles which are designed to postpone plasticization. Use a fully refined paraffin wax with low oil content, as oil accelerates this effect. Pigments do not react as easily with the packaging as dyes do but, in the majority of cases, pigments are only used for color overdipping and not for thru coloring candles. If you need to use dyes, use quality dyes and add a mixture of UV absorber and HALS additive and try to reduce or eliminate the use of fragrances and stearic acid. These steps will reduce and postpone the staining of your packaging film and the discoloration of your candles.
Dear Dr. Vela:

What guidelines should I follow in selecting coloring for vegetable oil-based candles (including fatty acids)?

Dear member:

I suggest you send the mix or product you are making to your coloring supplier. The esters contained in many natural waxes make them functional and can produce a reaction with the coloring and the fragrances that the paraffins wouldn’t normally have.

Dear Dr. Vela:

We bought a (paraffin) palm wax 1302 with which we have not been able to get the colors we used to be able to get with the national paraffin. Do you think we need to use a special dye?

Dear member:

It’s normal when using palm wax (whatever the reference) to experience difficulty in getting the same colors as one normally achieves when using traditional paraffin. Due to the nature of vegetable waxes, the same color will always behave in a different way with paraffin than with vegetable wax. There are only two solutions I would recommend: 1- trial and error with the same tonality of color but with different dye manufacturers and/or 2- ask the dye manufacturer you currently use to provide you with an equivalent dye for use with vegetable wax. This last alternative can prove to be complicated when using palm wax mixed with the traditional paraffin, as is your case. Lastly, it is always a good idea to contact your paraffin/wax supplier which should be able to assist you.

Dear member:

Paraffin (palm wax) is much more opaque than other types of paraffin. We can compare the properties of paraffin (palm wax) with that of stearic acid.

Due to the high opacity of this paraffin, it is necessary to use a higher percentage of color to be able to obtain the same tonality as before. Nonetheless, paraffin (palm wax) may contain some components that could change the color or even destroy it (the same happens with stearic acid).

We recommend you stabilize the paraffin and the color with a special stabilizing product which can be obtained from your color suppliers. The behavior of the product can vary with each case.
Dear Dr. Vela:

What is the best color antioxidant for fragranced candles and in what percentage should it be used? When using candle antioxidants how could we determine how long it will be effective? Can the same color antioxidant be applied to different wax formulas? Is it advisable to use the same antioxidant for different color raw materials?

What additive do you recommend for protecting and dispersing the candle aroma?

Dear member:

The question is not entirely clear, but I think I understand what is being asked. Dealing with antioxidants first. Most, if not all antioxidants are white in color. Antioxidants perform by preventing thermal degradation. That is they stop base waxes from turning yellow during heated liquid stages. Most are based upon a phenol backbone, the most commonly used being BHT at a level of 0.1% or less. However, antioxidants will not contribute to preservation of color in a solid candle. In this case UV ABSORBERS are required. These are substances which will absorb UV radiation (sunlight) at a percentage of 0.1% or less. Some trade names are Tinuvin and Cytec. Often mixed UV absorbers are used as, for instance, one will combat wavelengths that attack red colors whilst another will protect green.

Microwaxes and polyalphaolefins (such as Weissen) usually help.

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Dear Dr. Vela:

My blue candle turns green and loses its color. What can I do?

Dear member:

The problem could be the type of aniline or coloring you are using. The colors you use should be compatible with paraffin. Speak with your coloring supplier about this.
The problem could also lie in the lack of UV absorbers in the coloring you use. You can add the UV absorber yourself or speak to your supplier about selling you a color with the absorber included. This should eliminate the problem.

Finally, to obtain the color you want, make sure that your paraffin base is white and not colored.

Dear Dr. Vela:

Generally, wicks are chosen according to the candle diameter and also the type of paraffin. Does the color of the candle play a part in the wick selection? We have verified that candles of same diameter but of different colors do not perform alike with the same type of wick. Does the wick need to be chosen depending on the color of the candle? This will create problems because then it will be necessary to have a variety of wicks according to the colors of candles made by us.

Dear Member:

The wick should be chosen according to candle diameter and wax mixture. Color in itself should not have an effect in the burning. Red, blue, yellow should burn the same. The quality and type of dyes you are using might have an effect in the burning of your candles. This also could be said for the fragrance you are using. Talk to your color supplier.

Dear Dr. Vela:

For the purpose of understanding better the issue of color application in paraffin, additive, and fragrance mixtures, what is the ideal percentage of color dosage per kilo of mass to make pine green? Which are better, liquid or powder colorants?

Dear Member:

It is difficult to say the exact dosage of color you would need to obtain a pine green color, as it will vary depending on the tonality you are trying to achieve and the type of paraffin and additives you are using.

The majority of colors are basic colors. We recommend that you contact your color supplier and order the tone you want of that color. Some of our associate members can offer you this service including color pre-mixed in paraffin, so that you will get the exact tone you want.
In terms of which colorant is better: while here too it depends on the user, general opinion tends to lean towards liquid.

Remember that both colorants and fragrances must be compatible with the paraffin.