

PKN
Product Knowledge Network

*Everything you need to know
about nonstick-coated
houseware products — FREE.*

Coatings and Finishes for Exteriors

An exterior finish for cookware can be any material which, when applied, changes the basic appearance and/or function of that cookware from its natural surface.

The finish may be applied through the use of organic or inorganic materials. It may be fused using high heat; spray-applied and bake-dried; plated over metal; applied by an electrolytic (anodized) method; or silk-screened. In some cases, a decal is applied as decoration.

Each type of finish has certain advantages including: durability, heat and abrasion resistance, design, appearance. Certain requirements will make one finish more suitable than another. The exterior coatings discussed below are usually spray-applied and then bake-dried.

What are the different types?

Silicone polyester coatings are made from silicone polyester resins, which contain a copolymer (a silicone-modified polyester resin). If formulated properly, these copolymers may exhibit the best characteristics of both the silicone and polyester components. These exterior coatings have good temperature, scratch and wear resistance. In general, these coatings can be applied to any normal cookware surface: rolled, cast or anodized aluminum and stainless steel. However, stainless steel may require additional roughening to promote good adhesion.

Silicone enamel is simply a pure silicone coating without the polyester. Sometimes people confuse a silicone coating or enamel with a silicone-polyester coating. They ask for a silicone coating when they mean a silicone polyester. Also, beware of the term “enamel”; it is a very general term and can mean something different to all who use it.

A pure silicone has better temperature resistance and hot hardness, but it is much more brittle (and can chip more easily). Generally, adhesion is more difficult to obtain and in most cases needs a

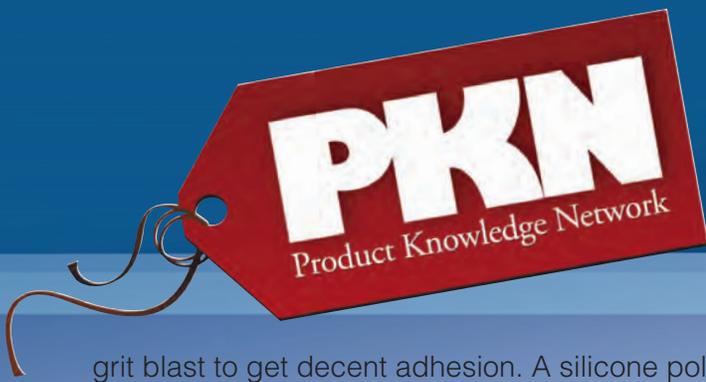


COATING INFORMATION

What you'll find here:

1. The different types of exterior finishes...
2. Pros and cons of each...
3. Considerations for a color match...
4. What impacts final color.

These topics, and more, await you on the Product Knowledge website, in the Coating Information section.



grit blast to get decent adhesion. A silicone polyester can easily go on an etched or cleaned aluminum surface.

Sol-gel ceramic coatings fall between silicone polyesters and porcelain enamel, as they offer a blend of both worlds. Sol-gels offer better chemical resistance, have high hardness and high heat resistance like porcelain, but the application is as simple as that of silicone polyesters. This means considerable energy/cost savings over porcelain enamel.

Porcelain enamel on aluminum withstands very high temperatures. These coatings start out as a frit (a glass-like substance) that is permanently fused to metal under extremely high temperatures. Initially the manufacturer must go through a very laborious process: the frit must be ground with pigments, water and additives to make a slurry. This slurry is then sprayed onto the pan (like a liquid coating) and cured at 550°C/1020°F. *Note:* high cure temperatures eliminate the use of thin-gauge aluminum, because it softens when heated above cooking temperatures.

Porcelain enamel on steel is only slightly different in that the parts are dipped instead of sprayed, applying enamel both inside and out, and then cured at around 820°C/1510°F to 850°C/1560°F. *Note:* these high cure temperatures drive energy costs way up.

Porcelain enamel has very good heat and scratch resistance (better than either silicone polyester or pure silicone), but has poor resistance to strong dishwasher soaps/chemicals. This is less serious in the United States, where one can expect a bit of color fade over time. However, in the EU, where the use of harsh dishwasher chemicals is common, colors fade more quickly and the coating can be damaged more readily.

High-temperature exteriors/high-temperature coatings: These can be all of the above, from silicone polyester to silicone to porcelain enamel. These terms are generally used as a generic for most exteriors.

Coatings that contain PTFE are usually more expensive and not as suitable for exterior use, since they must be removed from the bottom of the pan. Why? Because PTFE degrades quickly when exposed to direct flame or other high heat sources.

Type	Pros	Cons
Porcelain enamel	Great durability, very good heat resistance, scratch resistance	Poor dishwasher performance and complexity of application
Sol-gel ceramic	High hardness, very good heat resistance, lower application cost	High hardness increases brittleness, risk of chipping
Silicone (polyester and enamel)	Good durability and scratch resistance, easy to apply and dishwasher safe	Temperature resistance is not as high as porcelain enamel

Color and coatings

In basic housewares (cookware, bakeware, food prep), color has always been available, but usually focused on the basics: black, grey, and silver. In the 80s and 90s, colors such as hunter green, burgundy and cobalt blue began emerging as fashion complements to the typical black exteriors and finishes. Recently, red became the new black in North America, and over the past decade new colors and finishes have emerged, breathing new life into these products. Pantone® Color of the Year, metallic tones, spatter finishes, and colors from bright and vibrant to dim and demure have found a place on a variety of product lines.

When it comes to color on products that come in contact with food, there are requirements and restrictions that must be adhered to in order to achieve safe (FDA-acceptable) colors, which are then balanced against the desired color.

Considerations that go into creating a color match for your coating

Virtually any color can be achieved, but there are requirements to be considered which impact each

decision. The first step: choose the target color by using a standard color system such as Pantone® or RAL®. Then define the parameters, such as: is the application for an interior or exterior; will it come in contact with direct flame; and what are the performance requirements?

Once the important details are discussed with your coating supplier, the next thing to consider is the regulatory requirements: FDA, Prop 65 and EU compliance, etc. These requirements determine which pigments and ingredients are acceptable, since only food-contact-safe pigments and ingredients can be used.

Metamerism — the impact different light sources have on the visual appearance of a color — is an important consideration as well. The same color may look considerably different under fluorescent light than it does under sunlight.

For a housewares coating, there are application considerations as well. The coating must be heat-resistant, the color must be achieved in a relatively thin film, and it has to be able to be sprayed with good viscosity. And finally, the target cost is weighed into the equation.



*Today's offerings
make almost any
color combination possible.*



Factors that impact the final color of your product

The color of a coating is affected by oven temperature and dwell time, the air circulation within the oven, the coating thickness, the substrate, the roughness of the substrate, its heat conductivity, and the substrate preparation. All can affect not only the color, but the performance of the coating as well. Maintaining the accuracy and consistency of the color match is substantially more difficult with lighter colors. Most resin binders used are relatively dark and get darker the higher the temperature and the longer the time they remain in an oven. Precise oven dwell time is a major contributor to maintaining color consistency.

Conclusion

Working with a reputable coating manufacturer, providing all requirements up front and being aware of the impacting factors, will help you get the best coating for your project — including the desired color.



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