

## Buyers' Learning Tools



### Unit Three:

### Nonstick Finishes and Cookware and Bakeware Metal substrate

Consumers buy more nonstick cookware than any other kind. Here's what's important about it.

#### Two Major Types of Nonstick Coatings

**Silicone and Silicone Polyester formulations.** These organic-resins are typically applied to bakeware almost exclusively. They are not designed or formulated to withstand the direct high heat that cookware endures on top of stoves. They are designed to release high sugar content baked goods easily and to be dishwasher safe. In general silicone nonstick finishes are less costly than fluoropolymer based finishes.

**PTFE or Fluoropolymer formulations.** These nonstick coatings are almost exclusively found on cookware used on top of the stove. The active ingredient in the coating is a compound known as polytetrafluoroethylene, a waxy solid that is the most slippery substance yet discovered— more slippery than even wet ice. This compound is what gives fluoropolymer cookware finishes their ability to release foods.



**Ingredients of a nonstick coating.** For both silicone and fluoropolymer nonstick coatings there are at least four and sometimes five major ingredients:

1. A resin or binder that adheres to the pan surface
2. A pigment to color the coating
3. The release agent—either a PTFE or silicone compound
4. The carrier—either an organic solvent or water then “carries” the ingredients but which evaporates when the coatings is cured at high heat.
5. Optional reinforcing agents to provide wear protection

#### Coatings or layers

Coatings can be from one to three coatings in thickness. Most can also be reinforced for additional wear protection. As you can readily understand, multi-coat systems are more costly than one or two coat systems.

In a one coat system the binder, pigment, release agent and the carrier are all combined in a single liquid that is applied to the pan and then cured at a high temperature.

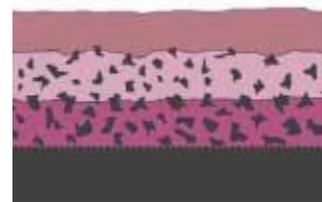
Two coat systems have a primer applied followed by a second coat with a higher percentage of release agent.

Three coat systems have a primer, a mid-coat with additional fluoropolymers to enhance the adhesion of the primer to the mid-coat and the mid-coat to the top coat and a subsequent top coat. Between each of the multiple coatings, the pan is run through a "flash-off" or drying step before the final cure.

Three coat systems can also be reinforced. There are two basic types of reinforcement

**External reinforcement:** This is typically done by spraying the surface of the pan with molten stainless steel to provide greater surface area for the coating to adhere to.

**Internal reinforcement:** This is usually accomplished by adding tiny particles of a hard substance to the primer and mid-coat. The final, topcoat of a three coat finish is not usually reinforced. This provides resistance to wearing while maintaining optimum release characteristics.



## Cookware materials and nonstick

Most aluminum cookware has a nonstick finish applied. Aluminum is easy to prepare and its conductivity make the curing process fairly quick and inexpensive. On the other hand, stainless steel is more difficult to coat with nonstick coatings. The surface usually has to be extensively prepared to accept the nonstick coating. Stainless is less conductive than aluminum so cure times are longer and hence more expensive. In addition, many consumers select stainless steel for its shiny look and the demand for nonstick applied to stainless is not as high as it is for aluminum pans. Nonsticks are less commonly applied to other materials such as cast iron, glass as well.

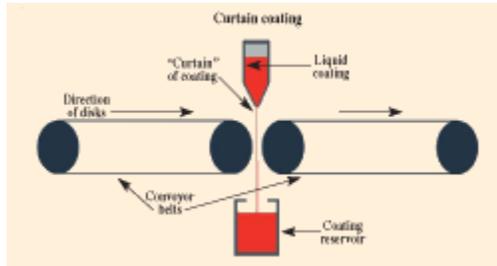
### Application Methods

Three major methods are used to apply nonstick coatings:

1. **Spraying.** Using air to atomize the nonstick material, the nonstick is sprayed onto the pan either automatically or by hand. Advantages include a more dense finish. Disadvantages include lower production rate than other methods and loss of expensive coating material via overspray (spray that blows past the product).
2. **Curtain coating:** Blanks (circular or square of the material used for the cookware and bakeware before it is formed into cookware or bakeware in a press) pass through a



curtain of nonstick coating while on a conveyer belt. Advantages are extremely fast production rates with almost no waste of the coating. Disadvantages: special formulations are required to coat properly and the blanks must be flat. Already formed shapes cannot be coated with this technique.



3. **Roller coating:** Blanks (circular or square of the material used for the cookware and bakeware before it is formed into cookware or bakeware in a press) pass through rollers to which the wet coating is applied. Passing through the rollers applies the nonstick, similar to rolling paint onto a wall. Advantages: Fast production rates with little coating loss. Disadvantages: Noticeable striations on the finished product. Here again, already formed shapes cannot be coated with this technique. Of these three application methods the spray is most expensive followed by curtain coating and then roller coating

### Use and care for nonstick finishes

1. Nonstick cookware and bakeware should always be washed before its first use. Most nonstick finishes will benefit from a small amount of cooking oil rubbed into the surface for the initial use as well.
2. Heat is the enemy of nonsticks. Use of low to medium heat will preserve food nutrients as well as protecting the nonstick finish. Make sure that food, oil or water is in the cookware before heating unless the recipe calls for preheating the pan before adding food. Aluminum nonstick pans heat extremely quickly.
3. Even though many nonsticks can withstand the occasional swipe with a metal utensil, the finish will last longer if nylon or wooden utensils are used. Sharp knives will pierce any nonstick finish quite easily.
4. Foods shouldn't be store in nonsticks (or any cookware for that matter). Nonsticks can stain if left in contact with some foods.
5. Nonstick cookware should cool before it is immersed in water.
6. Some nonstick cookware is dishwasher safe, although the high heat drying cycle of the dishwasher will degrade the nonstick finish over time. Additional dishwashers are hard on wooden handles particularly and some anodized finishes on the exterior of cookware. Hand washing is quick with nonsticks and is preferred, all though most consumers use the dishwasher anyway.
7. If burned residue collects on the nonstick surface a solution of 3 tablespoons of household bleach, 1 tablespoon of dishwashing liquid in one cup of water will usually

remove the residue, especially if allowed to soak for an hour. The surface should be reconditioned with a light wipe of cooking oil before using it again.

## **Overheated nonsticks and pet birds**

Overheated nonsticks can produce fumes that are harmful and fatal to birds. While rarely does this happen when food is in a nonstick pan, it is still recommended that pet birds never be caged in a home kitchen.

Birds have very sensitive respiratory systems and have been known to succumb to ordinary cooking fumes in addition to fumes driven from overheated nonsticks.

All producers of nonstick coatings recommend that avian pets be kept well away from kitchens.

## **Cookware and bakeware coatings and safety considerations**

Nonstick coatings applied to noncommercial housewares for use in homes and restaurants to prepare, dispense, or serve foods are exempt from the Food and Drug Administration's food additive regulation under what is commonly referred to as the "housewares exemption." There is one exception: The FDA will take immediate action to protect the public's health if the nonstick coating is found to adulterate food with unsafe substances.



Although housewares are not regulated per se, it is incumbent on the manufacturer and the retailer to ensure that each coating is formulated with ingredients known to be safe for use in contact with food and that are appropriate for the intended conditions of use. The prudent manufacturer will have testing performed by a third party laboratory and/or obtain certification from their coatings suppliers, to ensure that the nonstick coatings comply with the same FDA test criteria as coatings used in commercial applications. Nonstick coatings produced under the housewares exemption and tested in accordance with the FDA criteria may be said to comply fully with the Food, Drug & Cosmetic Act and all applicable food additive regulations. Manufacturers should be aware that products may need to comply with other state, federal and international regulations, depending on where the products are to be marketed.

Beware of any manufacturer's claim that the FDA has "approved" or has certified a coating. Nonstick coatings can be comprised of ingredients that are "generally recognized as safe" (known as the GRAS list) but the FDA does not test, certify or otherwise approve any coatings applied to noncommercial housewares products.

*illustrations courtesy Whitford Coatings*