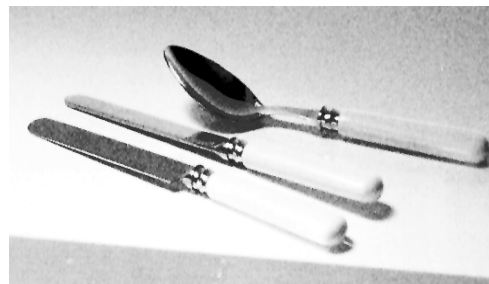


## Stainless Steel and Corrosion

### **Stainless Steel Defined -**

*"...an alloy steel containing 12 % or more chromium, so as to be resistant from rust and attack from various chemicals..." -*  
from Websters College Dictionary



### **Types of Stainless Steel**

As the paragraph above illustrates, any alloy of steel and 12% or more chromium can be categorized as "stainless steel". The quantity of chromium in excess of 12%, or the addition of other corrosion resistant metals to the alloy (nickel, molybdenum or vanadium, for example) are not considered in the definition. For this reason, flatware labeled and sold as stainless steel abounds. An items resistance to corrosion however, depends entirely on the *total* amount of chromium and additional metals that are part of the alloy. In other words, real and true distinctions exist between different types of stainless steel and their ability to resist corrosion.

### **Resistance to Corrosion**

The corrosion resistance of all stainless steel is a surface condition resulting from alloying iron with chromium or chromium / nickel. Contrary to popular belief, stainless steels are not rust proof or chemically inactive materials, but are alloys that resist corrosion better than other metals due to the formation of a thin passive film which separates the metal from the environment. This oxide film is transparent, adheres tightly to the surface of the steel, and is very thin - on the order of one-millionth of an inch. As long as this film remains intact on the stainless steel surface, the main steel body will be protected from corrosive attack (rust).

### **Types of corrosion**

The two predominant types of corrosion seen on flatware once the protective film has been breached are pit and surface corrosion. In pit corrosion, microscopic scratches or pits form in the flatware surface. Each time the pit is soaked, electrochemical action causes it to widen and extend deeper into the metal. Eventually the pit and its resultant corrosion becomes visible to the eye. In extreme cases, the corrosion can perforate the utensil. Surface corrosion usually starts at a scratch or pit and spreads laterally over a large area of the utensil. Destruction of the protective oxide film over the entire area usually results.

## **Causes of corrosion**

Many times the beginning of corrosion can be traced to the production process. When the steel is forged, pitting normally occurs. This type of pitting is removed during the sharpening and polishing process, but will often reappear after repeated cleaning in a dishwasher. Corrosion can also start through ordinary usage of a utensil, or by allowing acidic foods such as mayonnaise, butter, fruits, sauces, etc. to remain in contact with the steel. The longer the soils are allowed to remain in contact with the steel, the greater the likelihood and degree of subsequent corrosion becomes. Non acidic foods, such as salt (chlorides) can also cause corrosion, as can high concentrations of alkaline chemicals such as those found in dishwasher detergents. Continuous immersion in water above 140°F will accelerate the problem, as will accelerated drying. The higher the quality of the stainless steel, the longer it will resist corroding.

## **Stainless Steel flatware and Dishwashers**

Despite its shortcomings, stainless steel is still the most practical of all metals for family use. Because most damage to stainless steel occurs outside the dishwasher, that's where the most care is needed. Only dishwasher-proof cutlery labeled 18/10 stainless steel or molybdenum / vanadium stainless steel alloys should be washed in a dishwasher. Even then, areas of high internal stress such as knife blades and the tines of forks or the curve of a spoon will corrode under certain conditions.

The following tips will help reduce the likelihood of stainless steel corrosion:

- 1) After stainless steel flatware is used, it should be rinsed, especially if it is not going to be washed immediately afterward.
- 2) Dry detergent should never be allowed to come in contact with stainless steel. It should only be placed in the detergent dispenser.
- 3) Stainless steel cutlery should not be allowed to contact each other. Detergent granules may be trapped between the items and not dissolve. Undissolved detergents will accelerate the corrosion process.
- 4) Stainless steel flatware will occasionally develop a blue-gray surface film. This film usually consists of a thin but stubborn layer of food residues and can be removed by hand washing and towel drying.
- 5) To avoid water spots on stainless steel, use a quality liquid rinse aid in the dishwasher.
- 6) The protective oxide film will restore itself when exposed to oxygen in the air. For this reason stainless steel should only be stored when it is clean and dry. Following just this one tip will help keep stainless steel from corroding indefinitely.