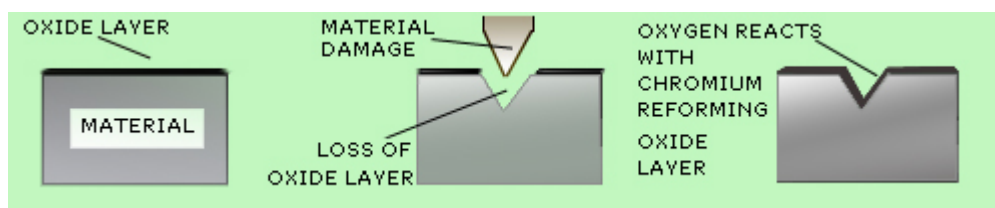


Stainless Steel

What is Stainless Steel?

Stainless Steel is a generic name for a family of corrosion resistant alloys of materials containing more than 11 % Chromium. A more appropriate name for this group of materials would be "Corrosion Resistant Steel" that have various properties, according to the alloying elements and methods of production.

Corrosion resistance is obtained by the alloying elements in particular the Chromium addition through a self repairing system. The material forms a very thin layer of chromium oxide that is inert from attack in most environments. When the oxide layer is broken through whatever method the chromium within the material re-oxidates with the atmosphere, forming another resistant layer

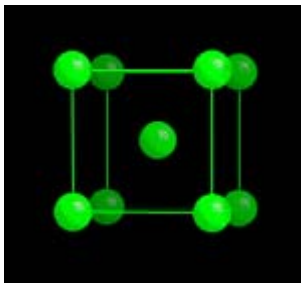


Types of Stainless Steel

There are many grades available that generally are categorised into the 5 basic forms

- Ferritic
- Austenitic
- Martensitic
- Duplex
- Precipitated Hardened

Ferrite



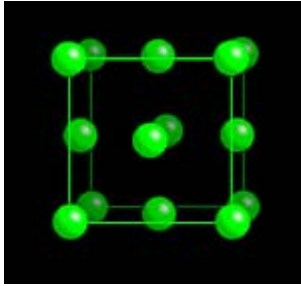
At ambient temperatures, iron crystallises into the body centre cubic structure known as the *alpha* ferrite – iron stage when referring to stainless steel alloys. The material is magnetic that is destroyed when transforming to the *beta* stage at the Curie point of 769° C. The structure still remains ferritic up to 910 ° C. The body centre cubic crystalline structure is characterised by moderate ductility which is important when referring to ferritic stainless steel. The basic composition of ferritic stainless steels is 12 – 18% Chromium with low carbon content.

Basic Properties

Typical Applications

- Moderate to good corrosion resistance, depending on level of chromium
- Magnetic
- May not be hardened by heat treatment
- Difficult to weld
- Not as good formability as austenitic grades
- Automotive Exhaust Systems
- Floppy disk hubs
- Civil Construction Equipment

Austenite



At temperature above 910 ° C a very stable structure becomes face centre cubic. This is none as the *gamma* stage – iron or austenite when referring to stainless steel. This material is characterised by high ductility and is non magnetic. The basic composition of austenitic stainless steel is 18 % Chromium and 8 % Nickel.

Basic Properties

- Excellent resistance to corrosion
- Easily welded
- Good formability and ductility
- Non magnetic
- May be hardened by cold working

Typical Applications

- Food Processing Equipment
- Pharmaceutical Processing Equipment
- Surgical Implant
- Semiconductor Plants
- Automotive
- Architectural
- Chemical Plant & Equipment

Martensite

Should normal carbon steel be heated into the austenite phase and quenched rapidly, the atoms are trapped , preventing the phase to change causing a shearing process and forming a complex body centre tetragonal material none as martensite. This material is magnetic and characterised by high strength and brittleness by having such internal stress. The internal strain may be controlled easily by heat treatment to particular desired level. Having a relatively high carbon content (0.1 – 1.2%) they are plain chromium steels with 12 -18% chromium.

Basic Properties

- Moderate to good corrosion resistance, depending on level of chromium
- Magnetic

- Can be hardened by heat treatment
- Difficult to weld
- Not as good formability as austenitic grades

Typical Applications

- Cutlery & Knives
- Food Processing Cutters
- Surgical Instruments
- Shafts
- Pins

Duplex Alloys

Duplex Stainless steels do not fully generate a austenite structure thus forming a combined structure of both austenite and ferrite. They are characterised by high resistance to stress corrosion cracking, increase resistance to chlorine and higher tensile strength. These grades of stainless steel contain high levels of chromium (18 -28%), relatively low levels of nickel (4.5 - 8%) and often contain high levels of molybdenum (2.5 – 4%)

Basic Properties

- High resistance to stress corrosion
- Increased resistance to chlorine attack
- High tensile strength
- Easily welded
- Good formability

Typical Applications

- Marine Industry
- Heat Exchangers
- Water Treatment Plants
- Petrol-Chemical Plants
- Civil Engineering

Precipitated Hardened

This category of stainless steels are formulated so that they are supplied in a solution treated condition that enables them to be machined and hardened following fabrication. This process is carried out in a single relatively low temperature process.

Basic Properties

- Moderate to good corrosion resistance, depending on level of chromium
- Magnetic

- Easily welded
- Exceptional high strength

Typical Applications

- Pump Shafts
- Valves