



## TYPES OF STEELS AND THEIR CORROSION

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<https://doi.org/10.5281/zenodo.5046611>

### ARTICLE INFO

Received: 15<sup>th</sup> June 2021

Accepted: 20<sup>th</sup> June 2021

Online: 25<sup>th</sup> June 2021

### KEY WORDS

carbon steel, alloy steel, mild steel, stainless steel, crevice corrosion, pitting corrosion.

### ABSTRACT

*The article is devoted types of steel and their corrosion and development of new types of inhibitors for the effective protection of steel samples from corrosion. The economic efficiency of many oil and gas companies in the country also depends on the creation and research of new types of steels and inhibitors.*

**Introduction.** Steel well-known alloy of iron and carbon is not as simple as one might think. There are two main types of steel: carbon steels and alloy steels.

Carbon steels consist of iron and contain no significant quantities other metals. Carbon steels can be divided into three main grades:

-Mild steel. The most widely used grade is a low carbon steel which contains up to approximately 0,3% carbon;

One weakness of mild steel is that it corrodes – its surface progressively deteriorates due to a chemical reaction. This reaction takes place between the iron in the steel and the oxygen in the air, to form iron oxide. When iron corrodes, we say that it rusts. In some metals, such as aluminum the presence of corrosion is not a problem, as the layer of oxide around the metal remains hard which prevents it from oxidizing any further.

However, when mild steel goes rusty, the rust on the surface comes off continuously, and a new rusty layer forms

progressively “eating into” the metal. The corrosion events causes significant metal loss. Of course it is a huge loss of finance. One of the basic ways to prevent corrosion is inhibition. The inhibitors are added to minimize corrosion event. The corrosion inhibitors are the chemical compounds that adsorbed on the metal surface, connects with metal ions and decreases the corrosion rate.

- Medium carbon steel contains between approximately 0,3 % and 0,6% carbon;

- High carbon steel contains between approximately 0,6 % and 1,4% carbon.

Alloy steels consist of iron, carbon and one more alloying metals.

Specific grades of alloy steel include:

- low alloy steels, which contain 90% or more iron and up to approximately 10% of alloying metals such as chromium, nickel, manganese, molybdenum and vanadium.



- high strength low alloy steels which contain smaller quantities of the above metals (typically less than 2%).

- stainless steels which contain chromium as well as other metals such as nickel and which do not rust.

Stainless steel is the most durable of metals. Its mechanical properties enable its structures to remain extremely resistant to rust. Nevertheless, corrosion can't be precluded. But there are ways to minimize the risk of corrosion. Stainless steel's fine layer of chromium oxide has natural techniques to self-repair when breached or broken. However, if the damage is too extensive corrosion can occur. There are various types of corrosion to be aware of.

The most common types are:

Pitting corrosion on stainless steel.

The passive layer on stainless steel can be attacked by certain chemical species. Chloride ion is the most common of these and is found in everyday materials such as salt and bleach. Harsh pitting corrosion is a localized damage that eats pits into stainless steel. In addition to chloride ion, can be caused by elevated temperatures for extended amounts of time or lack of oxygen to the surface.

Crevice corrosion on stainless steel.

Stainless steel requires a supply of oxygen to make sure that the passive layer can form on the surface. In very tight crevices it is not always possible for the oxygen to gain access to the stainless steel surface thereby causing it to be vulnerable to attack. Crevice corrosion is avoided by sealing crevices with a flexible sealant or by using a more corrosion resistant grade.

General corrosion on stainless steel.

Normally stainless steel does not corrode uniformly like ordinary carbon and

alloy steels. However, with some chemicals, mainly acids, the passive layer may be attacked uniformly depending on concentration and temperature and the metal loss is distributed over the entire surface of the steel. Hydrochloric and sulphuric acids at some concentrations are particularly aggressive towards stainless steel. General corrosion can be quite destructive and happen to the entire surface at once.

Galvanic corrosion on stainless steel.

If two dissimilar metals are in contact with each other and with an electrolyte (e.g. water or another solution), it is possible for a galvanic cell to be set up and to accelerate corrosion of one of the metals. It can be avoided by separating the metals with a non-metallic insulator such as rubber.

-tool steels which are extremely hard and are used in cutting tools. They contain tungsten and/or cobalt. A widely grade of tool steel is high speed steel which is used in cutting tools that operate at high temperatures, such as drill bits.

Researches of foreign scientists, as well as scientists of our country are devoted to the development of technology for the production of corrosion inhibitors. Corrosion, in particular, causes great damage to the national economy. We can see this from the data below. According to the literature, during the year developed throughout the year one-sixth of the steel alloys produced are used to replace corroded metal structures, equipment and spare parts. If we look at this figure worldwide, it is several million tons. It is obvious that the steel alloys produced by several smelters during the year are wasted.

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