Our modern world, with its skyscrapers, suspension bridges, and automobiles, relies heavily on steel. If you own an aging car however, you know firsthand that steel has one annoying problem: it rusts. All steel, that is, except stainless steel. What keeps this remarkable material, used commonly in kitchen sinks and cookware, from rusting?

**Rust-Proof**

Steel’s main ingredient is iron. When [steel](http://indianapublicmedia.org/amomentofscience/gun-silencers/)rusts, its iron combines with oxygen and reverts to iron ore, the raw state from which it came. As this happens, the steel turns brown and begins to crumble.

There are many ways to protect steel from corrosion. Steel is sometimes painted or greased, or coated with a metal that is less likely to rust.

**Sacrificial Metal**

Sometimes a metal that is MORE likely to rust is attached. Known as a sacrificial metal, this works by drawing the corrosion process away from the steel. For example, [bars of zinc](http://indianapublicmedia.org/amomentofscience/zinc-and-colds/) are attached to the hulls of some ships. The zinc rusts heavily, but the steel hull stays relatively safe.

**Stainless Steel Avoids Rust**

The best way to avoid rust is to use stainless steel. Like all steel, stainless steel is mostly iron, but it also contains nickel and chromium.

These are not just a protective coating, but are melted into the steel itself. The mixture must contain at least ten percent chromium, because it’s the chromium that protects stainless steel from corrosion.

**What Happens?**

What happens is this: Like a sacrificial metal, the chromium rusts first. Unlike iron however, rusting chromium doesn’t crumble apart. Instead, it forms an invisibly thin layer that protects the iron underneath. The [nickel](http://indianapublicmedia.org/amomentofscience/when-north-goes-south/)in stainless steel helps hold this protective layer of chromium rust in place.

Remember that chromium and nickel are present throughout stainless steel, not just on the surface. Because of this, the microscopic layer will form itself anew, even when the steel is cut or scratched.

我们的现代世界，其摩天大楼，吊桥和汽车，严重依赖钢铁。但是，如果你拥有一辆老化的汽车，你就会直接知道钢铁有一个恼人的问题：它会生锈。全钢，即不锈钢除外。是什么让这种非凡的材料（通常用于厨房水槽和炊具）不会生锈？

### 防锈

钢铁的主要成分是铁。当[钢铁](http://indianapublicmedia.org/amomentofscience/gun-silencers/)生锈时，它的铁与氧气结合并回复到铁矿石，铁矿石来自它的原始状态。当这种情况发生时，钢变成棕色并开始破碎。

有许多方法可以保护钢材免受腐蚀。钢有时涂漆或涂油，或涂有不易生锈的金属。

### 牺牲金属

有时会附着更容易生锈的金属。被称为牺牲金属，通过将腐蚀过程从钢中拉出来起作用。例如，[锌条](http://indianapublicmedia.org/amomentofscience/zinc-and-colds/)连接到一些船的船体上。锌大量生锈，但钢壳保持相对安全。

### 不锈钢避免生锈

避免生锈的最佳方法是使用不锈钢。像所有钢一样，不锈钢主要是铁，但它也含有镍和铬。

这些不仅仅是一种保护涂层，而是融入钢材本身。混合物必须含有至少10％的铬，因为它是保护不锈钢免受腐蚀的铬。

### 怎么了？

会发生什么：像牺牲金属一样，铬会先生锈。然而，与铁不同，生锈的铬不会崩溃。相反，它形成了一个无形的薄层，保护下面的铁。不锈钢中的[镍](http://indianapublicmedia.org/amomentofscience/when-north-goes-south/)有助于将这种铬锈保护层固定到位。

请记住，铬和镍存在于不锈钢中，而不仅仅是表面上。因此，即使切割或刮擦钢，微观层也会重新形成。