The self-repair mechanism of stainless steel

Stainless steel has a unique feature: It is self-healing. Due to the alloying elements in the stainless steel, a thin, transparent "passive layer" is formed on the surface.

Even if the stainless steel surface is scratched or damaged otherwise, this passive layer, which is only a few atoms thick, instantaneously reforms under the influence of oxygen from air or water.

This explains why stainless steel does not require any coating or other corrosion protection to remain bright and shiny even after decades of use.