

# Love your boiler, love your system.



## Galvanic corrosion in heating systems

Heating systems containing mixed metals are most at risk from galvanic corrosion. Our modern boilers contain various different metals including; copper, stainless steel, composites, brass and aluminium, depending on the model. Most heating systems also contain mild steel (radiators) along with copper, brass and plastic piping. Potentially a very mixed bag.



**Vaillant**

Comfort for your home

# Galvanic Corrosion in Heating Systems

## What is Galvanic Corrosion?

Galvanic corrosion is an electrochemical process causing excessive corrosion in one or two metals in contact with one another in the presence of an electrolyte. In our case, this electrolyte is the system water itself.

## How does this occur?

Metals are graded on the noble scale. Metals which are next to one another on the scale have the least difference in electric potential, so will not react together, however metals which are further apart will react more favourably with one another. When this occurs, the most noble metal will become the cathode, and the least noble metal will become the anode. This causes the anode to suffer heavy corrosion as part of the reaction.



## What does this mean?

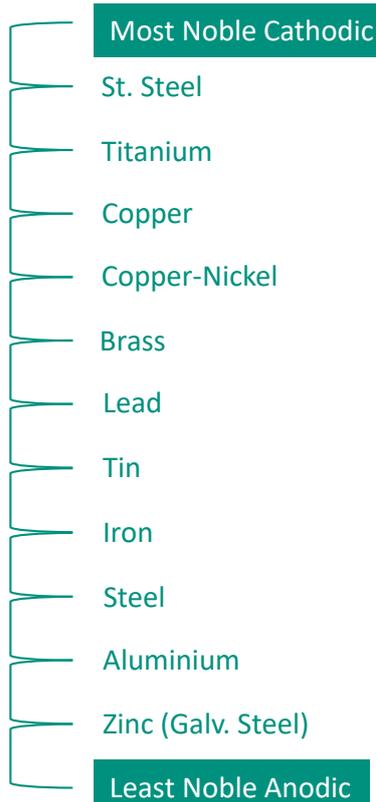
This means that if the system is treated incorrectly, the possibility of a reaction between copper in the pipework, and aluminium in the heat exchanger becomes a real possibility. If the system water is corrosive, either high or low pH, the oxide layer protecting the metals is likely to be stripped away which will begin the corrosive process on the metal surfaces. If this happens to the copper pipes in the system, copper particles can electro plate themselves on to the surface of the aluminium heat exchanger and on to the steel surfaces of radiators and cause excessive localised corrosion (pitting).

This is common in new installations where the active flux used for soldering has not been flushed out of the system correctly, or at all. In radiators, this will often manifest in pin holing, where the corrosion in place is enough to cause mechanical failure of the component. In any case, the corrosive process is accelerated and the potential for hydrogen gassing is vastly increased.

## Is this caused by our heat exchangers?

In a word, no. This reaction is entirely caused by the chemistry of the system water itself, and, can easily be resolved by using good quality cleanser and inhibitor when installing the system. Cheaper inhibitors tend to be less protective of multiple metals, and less tolerant of existing problems. Use of a good quality inhibitor on a clean system will protect against this and prevent the system from reacting with the metals in the boiler itself.

### Nobility of Common Metals



It's easy to see from the chart, that copper and aluminium are far apart on the scale and, as a result, will easily react with one another if the conditions are correct.