



## Water Heater Sacrificial Anode Rods

Potable water is seldomly pure H<sub>2</sub>O. It is a mixture of water, oxygen, calcium, magnesium, fluoride and other particles. The content of potable water will vary from one geographic location to another. The above ingredients add such things to the water as taste, color, odor and the ability for the water to be conductive (electrolytic). Conductivity allows for electricity to flow through the water resulting from the movement of electrons from one metal (anode) to another metal (cathode.) This is similar to a battery where the anode is the negative terminal and the cathode is the positive terminal. The amount of electricity can be controlled by varying the water chemistry (electrolyte) or changing the metals used in the reaction.

Water heater tanks are typically constructed of steel with a porcelain enamel (glass) lining. Due to production and assembly methods it is not always possible to obtain complete coverage of the steel tank. Therefore, it's necessary to provide a different metal (anode) to inhibit corrosion of the tank (cathode). The anode supplies electrons to the cathode and releases positive hydrogen ions and positive metal ions to the water. Release of the positive ions make the anode appear to dissolve which is a planned and expected situation. Consequently, the anode is frequently referred to as a "sacrificial rod." Electrons travel to the cathode and combine with the hydrogen positive ions to eventually form H<sub>2</sub> gas. No metal is lost at the cathode as it is protected by the anode. Due to generation of hydrogen ions at the anode, it is possible for hydrogen gas to form which is explosive and warnings are placed on every unit, including the installation instructions, to alert homeowners about the danger of flames near the water outlet.

Water heater manufacturers attempt to produce a standard product that will satisfy the majority of customers. A magnesium anode will satisfy the majority of water chemistry situations. Extremely hard water or high conductivity areas may require an aluminum anode evidenced by a high turnover rate of water heaters, coffee makers and other using appliances.

**The combined presence of hydrogen, sulfur, and bacteria cause foul smelling water. The magnesium anode rod installed in the tank protects the tank surface but generates enough hydrogen to create an odor when it interacts with sulfur in the water or bacteria in the tank. Replacing the magnesium anode rod with an aluminum anode may minimize the problem.**

The most efficient method of eliminating the hydrogen sulfide odor is to control the bacteria. As a rule, chlorination of public water supplies kills the bacteria, but some private well systems may need to be purified by the use of chlorine injectors or ultraviolet light. This will destroy the bacteria.

