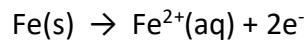


Answer on Question #73701, Chemistry / General Chemistry:

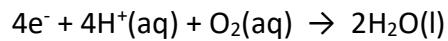
What statement describes how iron reacts with oxygen dissolved in water

Solution.

When a droplet of water containing a little dissolved oxygen falls on an steel pipe, the solid iron or Fe(s) under the droplet oxidizes:



The electrons are quickly consumed by hydrogen ions from water (H_2O) and dissolved oxegen or $\text{O}_2(\text{aq})$ at the edge of the droplet to produce water:

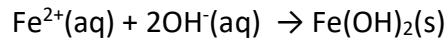


More acidic water increases corrosion. If the pH is very low the hydrogen ions will consume the electrons anyway, making hydrogen gas instead of water:

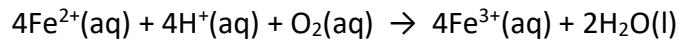


But where's the rust? The equations above tell only a small part of the story.

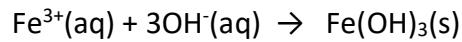
Hydrogen ions are being consumed by the process. As the iron corrodes, the pH in the droplet rises. Hydroxide ions (OH^-) appear in water as the hydrogen ion concentration falls. They react with the iron(II) ions to produce insoluble iron(II) hydroxides or green rust:



The iron(II) ions also react with hydrogen ions and oxygen to produce iron(III) ions:



The iron(III) ions react with hydroxide ions to produce hydrated iron(III) oxides (also known as iron(III) hydroxides):



The loose porous rust or $\text{Fe}(\text{OH})_3$ can slowly transform into a crystallized form written as $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ the familiar red-brown stuff that is called "rust". Since these processes involve hydrogen ions or hydroxide ions, they will be affected by changes in pH. With limited O_2 , magnetite is formed Fe_3O_4 .

Answer: $4\text{Fe} + 3\text{O}_2 + 6\text{H}_2\text{O} \rightarrow 4\text{Fe}^{3+} + 12\text{OH}^- \rightarrow 4\text{Fe}(\text{OH})_3$ or $4\text{FeO(OH)} + 4\text{H}_2\text{O}$