METALTalk
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SOLUTIONS: Damage at High Temperatures

2 Questions asked relating to the alloys we offer are, in general, along these lines:

Q1: Can 904L be used in 20% sulphuric acid?

Q2: What can I use to construct a kiln to operate at 950 deg C?

When contrasting these questions its quite noticeable that those relating to aqueous corrosion may omit the temperature information whilst those for high temperature applications often only state the temperature without any reference to the chemistry of the environment that the metal will be exposed to.

When it comes to **elevated temperature** applications the significance of the temperature is important for 2 reasons. Firstly because it plays a part in determining if corrosion will take place and at what rate. Secondly, at elevated temperatures metals are subject to creep - a phenomena in which metal deformation takes place over time at loads which will be significantly lower than the design strengths of the material at room temperature. Thus knowing the temperature is most important.

But so too is knowing the **details of the environment.** High temperature corrosion may be divided in to the following modes based on the distinctive nature of the damage and mechanisms:

Oxidation	*Carburization*	*Molten Salt/Compound Corrosion*
Sulfidation	*Halogen Corrosion*	*Molten Metal Corrosion*
Nitridation	*Ash / Salt Deposit Corrosion*	

Whilst these are listed as unique modes in fact one or more may occur simultaneously thus further complicating the damage process.

In both cases, aqueous corrosion and elevated temperature damage, the mechanism is an electrochemical reaction of a metal with is environment and thus the environment must be known as well as other factors that may drive the reaction. Temperature is of course one of these but there are others.