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Bi-Metallic Corrosion Advice

Bi-metallic Corrosion (or Galvanic Corrosion) is the process by which metals, when in contact with each other, oxidize or corrode. In order for Bi-metallic Corrosion to occur there are three conditions that must exist, or the process of corrosion will not begin under any circumstance.

1. There must be two electrochemically dissimilar metals present but not necessarily in contact with each other.
2. There must be an electrically conductive path between the two metals.

There must be an electrolyte to allow the metal ions to conduct along the provided path from the more anodic metal to the more cathodic metal.

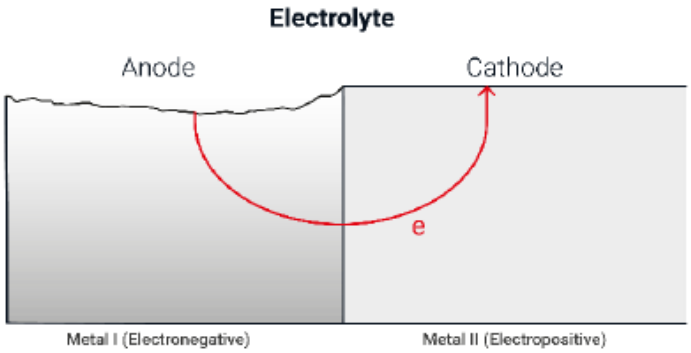

Figure 1. Schematic illustration of bimetallic corrosion

There are several variables that contribute towards bi-metallic corrosion in addition to the base metals, the type of electrolyte and the type of environment the installation is in. If you had a mix of materials in a relatively dry benign environment, you may witness a very slow rate of corrosion. If you were to put the same products in a factory that exhausted acidic or alkaline moisture into the atmosphere with a high change in temperature the rate of corrosion would be considerably accelerated. So, the inside of factory in northern latitudes could exhibit the same condition as the costal desert regions in the middle east.

The preparation of the materials and their selection are critical, one type of aluminium will corrode faster than another same with brasses and steels. Using aluminium as an example if the aluminium substrate of an enclosure has a chromate conversion coating it will suffer less corrosion than the same raw untreated material would. If an enclosure is treated and prepared and then a thread is cut into it that would undo the corrosion protection of the product. One grade of aluminium when mated with another grade of aluminium can still be anodic and cathodic.

It is impossible to generalise about materials science The business publishes the grades of the materials it uses so that its customers may make educated decisions about their installations which we as a business cannot as the end use and conditions are infinitely variable.

The following table lists a variety of materials. The further apart those materials are on the galvanic scale the higher the probability the conditions for corrosion may occur.

It should also be noted that certain environments will corrode materials in their own right without the assistance of galvanic action. If the customer is uncertain of the operational conditions, it is advised they consult a specialist in the subject.

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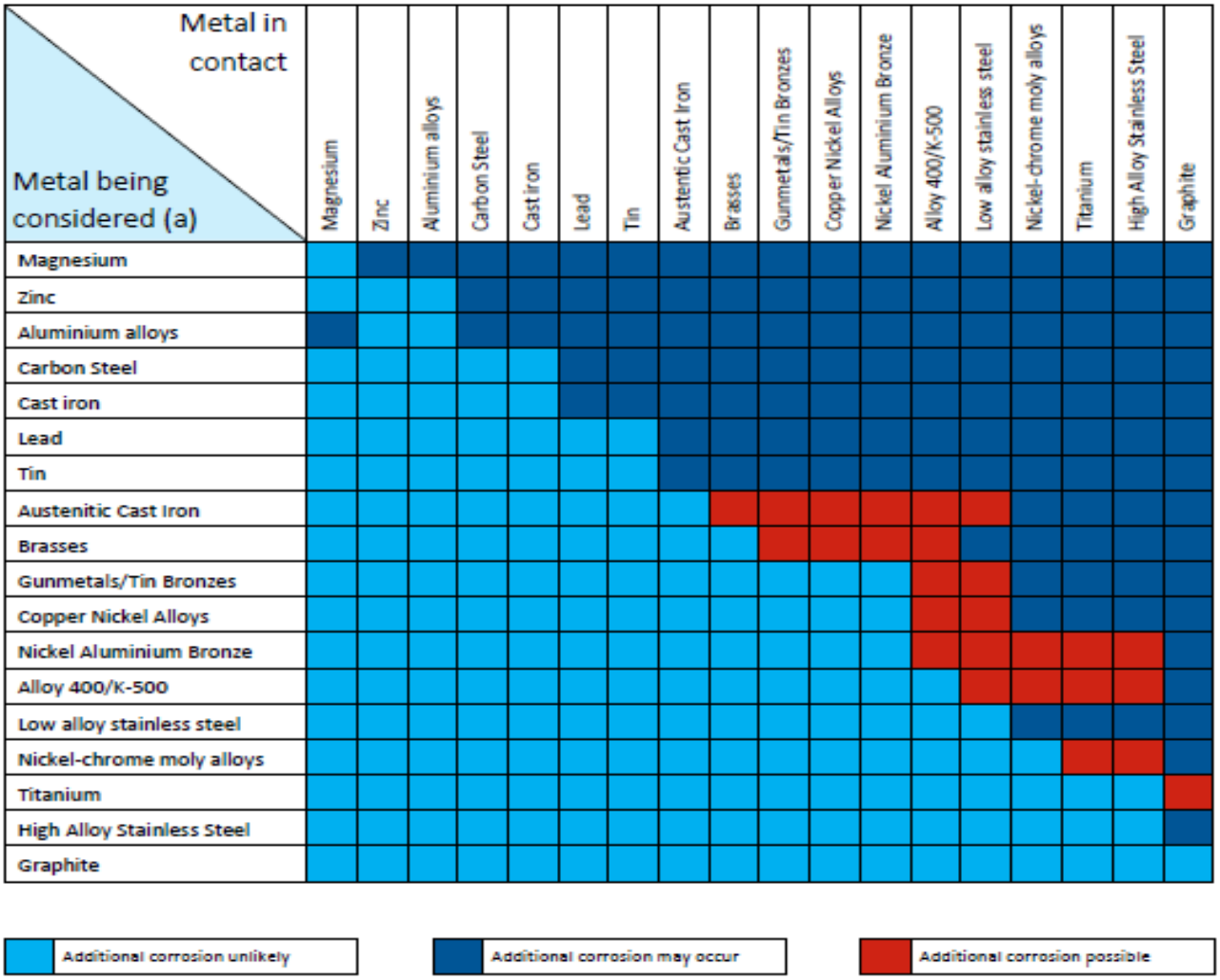

Figure 2. Risk of additional corrosion from bimetallic contact in neutral aqueous electrolytes. [Each of the two metals must be read against the other. the degree of corrosion always refers to the metal on axis (a)]

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