INFLUENCE OF HYDROGEN IN SOME METALS ON AQUEOUS-AND GASEOUS CORROSION.

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Abstract

Recent investigations have shown that the presence of hydrogen in stainless steel (1) and in chromium (2) increases the anodic dissolution rate in aqueous solutions. It has also been found that hydrogen in several metals and alloys influences the high temperature oxidation kinetics, and the position of oxide growth (3,4). These observations can be explained by an increased metal cation mobility in the oxides. In the case of chromium, an increased anodic current in chloride solution (2) and increased oxidation rate in O_2 at 900^0C (4), take place due to the presence of hydrogen in the metal. However, the influence of hydrogen is not always detrimental. In some Yttria-containing alloys, hydrogen up to a certain concentration has been found to reduce the reaction rate in O_2-gas (4,5) and here we present results showing a positive effect of hydrogen also is present in aqueous corrosion of these alloys. The influence of hydrogen in iron and some iron base alloys on the corrosion resistance in various aqueous solutions will be reported. The corrosion resistance was evaluated from measurements of weight loss, anodic polarization and impedance spectroscopy. Moreover, the 18O/SIMS-technique, from which the position of oxide growth can be found, has been used in O_2-oxidation studies of various iron samples at elevated temperatures. Both the effect of hydrogen and additions of oxygen dissociating elements (Ce and Pt) on the reaction of iron were investigated. Our results on iron from the aqueous and gaseous corrosion measurements are discussed in terms of protective and non-protective oxides, position of oxide growth and balanced metal and oxygen ion transport.

References

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