Abstract

Corrosion of low carbon steel type S235 (grade A) is important because this type of steel is used in various maritime assets and infrastructure. To understand under which conditions the corrosion rate of this steel increases strongly, steel coupons from S235 were exposed in a test basin in a controlled manner to a variable temperature, pH, salinity, and concentration of dissolved oxygen. Real-time measurements of these parameters (via the Aquaread multiprobe) were correlated with the course of the corrosion, measured via weight loss of these coupons and via specific linear polarization resistance sensors (Cosasco, CCube), and subjected to a principal component analysis. The environmental factors that have the greatest influence on the speed of the corrosion process are the salinity and associated conductivity of the surrounding water and the temperature. The amount of dissolved oxygen was found to be inversely proportional to the corrosion rate of the metal (correlation factor of -0.642), contrary to what is reported in most of the literature on corrosion. This negative correlation can be explained by the formation of a well adhering corrosion product, which results in a reduction in anodic current and therefore also a lower corrosion rate.