The role of HCO_3^- and iron bacteria in the tubercle formation on ductile iron pipelines in aerobic alkaline soil

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Abstract

The author noted that a natural gas 150 mm diameter ductile iron pipeline corrosion as high as 0,384 mm/y in aerobic alkaline soil containing HCO_3^- and iron bacteria. The pipeline had been in service of 17 years. The aerobic iron bacteria contain chemolithotrophic autotrophs, which can be considered to obtain energy from the oxidation of $Fe(CO_3)_2^{2-}$ to FeOOH. It is probable that the observed formation of stabilizing hard tubercles is the result of the coexisting opposite charges, that is, positively charged FeOOH and negatively charged $H_3SiO_4^-$ in soil. Thus, tubercles shield the surface of pipes from oxygen, resulting in differential aeration corrosion. Graphitic corrosion occurs at the pit beneath the tubercle.