

Analysis of the influence of different parameters on the corrosion of underground pipelines

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In this work, the influence of different parameters on the internal and external corrosion modes of pipeline steels was analyzed. In this context, the inclusions distribution, the presence of organic acids and soil conductivity versus the atmospheric relative humidity were studied. It was shown that humic and fulvic acids, present in soil organic matter can influence the corrosion of API steels in sulfate solutions. This influence is significantly lowered, when inclusions are not present, as in the case of commercial pure Fe. A similar behavior was observed for additions of naftenic acids. Naftenic and humic acids promote the depassivation around inclusions, modifying the usual passive behavior of pure Fe in sulfate solutions, while fulvic acids inhibit this inclusion attack and pit nucleation. A linear correlation between the pitting potential in sulfate solutions was determined for the inclusions concentration and total perimeter of the inclusion-matrix interface. The influence of organic acids on this pitting potential-inclusion distribution was quantified. Exposures of API steels to soils in an environmental chamber showed that the corrosion rate greatly depends on the soil hygroscopicity and also in this case the corrosion attack is related to the presence of complex inclusions.