Corrosion Evaluation of Pipeline Steel API 5L X52 in partially deaerated Produced Water with High Chloride Content

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The corrosion mechanism of pipeline steel X52 exposed to produced water is proposed based on identified chemical species and scale after 270 days. Polarization curve profiles suggested that steel corrosion products are formed and removed periodically. X-ray diffraction, Mössbauer and Ultraviolet-visible spectroscopies identified akaganeite/lepidocrocite ($\text{Fe}^{3+}\text{O}(\text{OH})$) along with goethite ($\alpha\text{-FeOOH}$) and magnetite (Fe_3O_4) as a result of iron oxidation in water to conform an external layer. XPS detected the presence of FeCl_2 and $\text{Fe}_2(\text{SO}_4)_3$ in the internal layer derived from previous adsorption on the surface. SEM indicated the presence of general and localized corrosion under corrosion products.

Keywords: Pipeline steel; Corrosion behavior; Produced water; Surface analysis; Electrochemical techniques.

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