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**A life prediction model for P110S steel in deep-well environments with H<sub>2</sub>S/CO<sub>2</sub> coexistence based on multi-factor chemometric drive**

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**Abstract** A mechanistic-chemometrics model for life prediction of P110S steel in deep-well environments with H<sub>2</sub>S/CO<sub>2</sub> coexistence was proposed. The model was developed by considering the interaction mechanism between uniform and pitting corrosion, then modified using a multi-factor chemometric drive incorporating temperature/pressure, flow velocity, stress. Finally, the pit-to-crack transition was modeled using finite element design and direct current potential drop measurements, completing the life prediction process. The model predicts a lifespan of 2.28 to 5.25 years at different well depths, and this result was validated with on-site data, indicating the model's accuracy. The knowledge paradigm provided herein will assist in corrosion prediction.