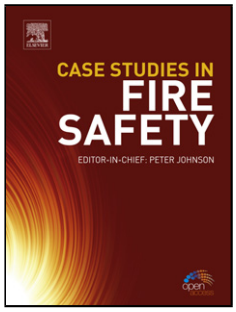

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Effect of water content on the corrosion behavior of X65 pipeline steel in supercritical CO_2-H_2O-O_2-H_2S-SO_2 environment as relevant to CCS application

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Highlights

- The water content limit was 1500 ppmv in CO_2-O_2-H_2S-SO_2 streams at 10 MPa and 50 ºC.
- The water content in CO_2 streams notably affected the corrosion film characteristics.
- The impurity interactions promoted the precipitation of water phase from CO_2 streams.
- The water chemistry characteristics depended on impurities and impurity interactions.
- Effect of water content in CO_2 streams on corrosion mechanism of steel was discussed.

Abstract: The water content limit of 1500 ppmv was obtained in supercritical CO_2 streams containing 200 ppmv O_2, 200 ppmv SO_2 and 200 ppmv H_2S at 10 MPa and 50 ºC. Concurrently, the thermodynamic calculation suggested that impurities could change the corrosion process through promoting the water precipitation and changing the water chemistry characteristics. When water content was below 1500 ppmv, the corrosion effect of impurity interactions dominated the corrosion process of X65 steel. Whereas upon increasing the water content over 1500 ppmv, the corrosion effects from impurity interactions and individual