Corrosion Study of Common Steels Exposed to 1,100+ Hours of Continuous PCC Operation:
Direct Comparison of Morphological and Chemical Tenacity During Test Campaign at the National Carbon Capture Center
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Introduction
The objective of this study was to demonstrate the compatibility of four different steel materials at the surface level that had been continuously exposed to ION’s solvent at different locations in the PCC test unit at the National Carbon Capture Center (NCCC) with their unique process temperatures, alkalinities and solution chemistries. Materials of construction have a large influence on CAPEX for PCC-based facilities that utilized high-pH amine-based solvents.

Experimental
Stainless steels 304, 304L, 316 and carbon steel grade C1010 were inserted into various locations of the Pilot Solvent Test Unit (PSTU) at the NCCC while testing CO2 capture with real coal-fired flue gas using ION Engineering’s (ION) proprietary solvent. Nine sets of each steel (36 coupons in total) were exposed to over 1,100 hours of continuous PCC operation and compared to an unexposed set (4 coupons) as a negative control. The 40 coupons were analyzed by SEM, EDS and weight-loss methods.

Sample Coupons
Appearance of sets:
Wash tower (left), and bottom of absorber (right).
Reboiler return line (left) and top of regenerator (right).
Mist separator (left) and cross heat exchanger (right).

SEM and EDS results:
C1010 (upper two) and SS 304 (lower two):

C1010 passivation protection with FeCO3?

References
• ASTM-G1 & G4 and NACE Recommended Practice RP-0775.

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