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ABSTRACTS

Cooling Tower Operating and Water Treatment Fundamentals – Part 4

Brad Buecker

Cooling towers and cooling water systems are an integral feature of many power plants and thousands of industrial facilities. The previous installments of this series focused on microbiological fouling and corrosion issues, as these mechanisms can cause severe problems. But by their very nature, cooling towers, in which water evaporation is the primary heat transfer method, cause an increase in concentration of both dissolved and suspended solids. Deposition and scaling can become quite problematic without careful chemistry control. This installment examines scale-forming mechanisms. In Part 5, we will examine modern corrosion/scale control chemistry. Some chemical inhibitors serve a dual function.

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Pre-Stripper Sulfite-Induced Coal Fly Ash Leaching – Part 1: Leaching of Iron(II) and Iron(III) as Monitored by Spectrophotometry

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Iron (Fe) is known to catalyze oxidative degradation of amines in the post combustion CO_2 capture (PCCC) process. However, sources of Fe for such degradations are poorly characterized. One aspect of the PCCC process which is poorly researched is the interaction of sulfur dioxide (SO_2) gas in the flue gas (FG) with coal fly ash (CFA) and how this can affect amine degradation. Understanding that the SO_2 would be dominantly present in the anionic pH speciated forms (bisulfite (HSO_3^-(aq)) and sulfite (SO_3^{2-}(aq))) as a result of caustic scrubbing or amine-based desulfurization and that ammonia is commonly present either in original FG or as an amine degradation product, CFA leaching of Fe by ammonium sulfite ($(NH_4)_2SO_3$) was experimentally examined under different pH (~ 4 to 10) and temperature (50 °C to 90 °C) conditions to simulate various pre-stripper sections within an amine solvent based SO_2 and carbon dioxide (CO_2) capturing process such as at the Boundary Dam Unit 3 carbon capture and storage (BD3 CCS) facility. The results suggest that SO_2 and its pH-speciated aqueous forms can leach Fe, and thereby catalyze oxidative degradation of common amines used in capturing acidic contaminants from post-combustion FG. With the addition of $(NH_4)_2SO_3$ (0.25 $mol \cdot L^{-1}$), the effect of SO_3^{2-} on the leaching of iron(III) (Fe^{3+}) and iron(II) (Fe^{2+}) was apparent and distinctly different from the effect of pH per se. Thus, irrespective of the amine type, SO_2 and its pH speciated forms can generate Fe ions to catalyze the degradation. Still, SO_3^{2-}-induced Fe leaching occurred more dominantly in acidic solutions that simulate the pre-scrubber and amine-based SO_2 capture conditions (pH ≤ 6) and less in alkaline aqueous conditions simulating amine-based CO_2 capture (i.e., pH of ~ 8 to 10).

The work does not seem to support an effect of SO_2 on CFA leaching of Fe under pre-stripper conditions as the principal factor in catalyzing oxidative degradation of amines used in CO_2 capture, even though the association with pH depression could still make it significant. At pH = 8, the total leached Fe ions averaged only ≤ 0.2 mg · L^{-1} and ≤ 1.0 mg · L^{-1} from CFA obtained from flue gas cooler inlet and the caustic polisher in the SO_2 loop, respectively. Yet, in an integrated amine solvent SO_2 and CO_2 capturing process as employed at BD3 CCS, the effect is expected to be more significant with respect to amine degradation within the SO_2 capture process.

PPCHEM® 2025, 27(1), 14–32

ABHUG2024 Highlights and Press Release

The annual meeting of ABHUG held on the 3rd to 5th December 2024 in Brisbane, Australia was chaired by Barry Dooley of Structural Integrity Associates, UK and Bob Anderson, Competitive Power Resources, USA. This ABHUG conference included conventional fossil boiler technology and issues closely related to those in HRSGs. ABHUG2024 attracted 90 participants from Australia, New Zealand, UK and USA. About 45 % of the participants were Users. The next meeting of ABHUG will be in Brisbane in November 2025.

PPCHEM® 2025, 27(1), 34–35

How to Analyze Film-Forming Amines – Analytical Methods and Best Practices

Ronny Wagner

Film-forming amines (FFAs) are increasingly being used instead of conventional conditioning chemicals, as they offer advantages in corrosion protection, especially during operational shutdowns. This article offers an examination of the analytical methods used for quantifying FFAs, highlighting their theoretical basis, practical applications, and inherent challenges. It addresses sampling protocols and monitoring techniques to ensure optimal performance and compatibility within diverse systems. The goal is to provide a comprehensive technical resource for researchers and practitioners aiming to enhance the efficacy of FFAs in industrial applications.

PPCHEM® 2025, 27(1), 38–42

2024's Scientific and Technical Contributions

PPCHEM® 2025, 27(1), 48–56