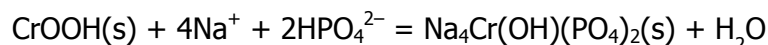


Abstracts**Stephen E. Ziemniak and Edward P. Opalka****Phase Stability of Chromium(III) Oxide Hydroxide in Alkaline Sodium Phosphate Solutions**

Grimaldiite (α -CrOOH) is shown to transform to a sodium chromium(III) hydroxyphosphate compound (SCrHP) in alkaline sodium phosphate solutions at elevated temperatures via



X-ray diffraction analyses indicate that SCrHP possesses an orthorhombic lattice having the same space group symmetry (Ibam, #72) as sodium ferric hydroxyphosphate. The thermodynamic equilibrium for the above reaction has been defined in the system $\text{Na}_2\text{O-P}_2\text{O}_5\text{-Cr}_2\text{O}_3\text{-H}_2\text{O}$ for Na/P molar ratios between 2.0 and 2.4. On the basis of observed reaction threshold values for sodium phosphate concentration and temperature, the standard molar entropy (S^0) and free energy of formation (ΔG_f^0) for SCrHP has been calculated to be 815.4 and $-3\,497.01\text{ kJ}\cdot\text{mol}^{-1}$, respectively.

Santhanam Ranganathan, Madapuzi. P. Srinivasan, Sevilmedu V. Narasimhan, Pandalgudi S. Raghavan, and Raghavachary Gopalan**Kinetics of Dissolution of α -Fe₂O₃ and γ -Fe₂O₃ in EDTA and NTA-Based Formulations**

The dissolution studies were carried out on haematite (α -Fe₂O₃) and maghemite (γ -Fe₂O₃) in two different formulations of ethylenediaminetetraacetic acid (EDTA) and nitrilotriacetic acid (NTA). The rate constants were calculated using the "inverse cubic rate law." The leaching of the metal ions from the oxide is controlled partly by the Fe(II)-L_n (L is a complexing ligand and n is the number of ligands attached to Fe^{2+}), a dissolution product arising from the oxides having Fe^{2+} in the lattice. The addition of Fe(II)-L_n along with the formulation greatly increased the initial rate of dissolution. The effect of the addition of Fe(II)-L as a reductant on the dissolution of α -Fe₂O₃ was not the same as in the case of γ -Fe₂O₃. The rate constants (k_{obs}) for the dissolution of α -Fe₂O₃ and γ -Fe₂O₃ in the presence of ascorbic acid were less in the EDTA formulation than in the NTA formulation. The studies using Fe(II)-NTA and Fe(II)-EDTA with varying compositions of citric acid and ascorbic acid revealed that a minimum quantity of the chelant is sufficient to initiate the dissolution process, which can be further controlled by the reductants and weaker chelants such as citric acid.

Nigel J. Drew**Evaluation of Degassed After-Cation-Exchange Conductivity Techniques**

After-cation-exchange conductivity (ACC) systems are the universally used method for rapid detection of anionic impurity ingress into the steam/water circuit of power plant. In some utilities, ACC is measured after degassing the sample. It is generally considered that carbon dioxide is the least aggressive contaminant of feedwater that is normally present and causes elevation of the measured ACC. The elevation of ACC by carbon dioxide can be particularly noticeable when the oxygen scavenger is

carbohydrazide, or the water contains dosed amines or neutral organic compounds in the make-up water. Ingress of carbon dioxide could be considerable in the case of tube leakage in some parts of the boilers of gas-cooled nuclear stations. The elevated ACC then delays unit start-up. There are two widely used techniques for degassed ACC systems: gas stripping with nitrogen and heating to near boiling. Membrane gas-exchange systems are now also beginning to appear on the market. British Nuclear Fuels Plc. and British Energy arranged for an evaluation of these three types of system to determine if they would be sufficiently effective for use in their power stations. The results of the evaluation are summarised here and measured values are compared with theoretical calculations for ACC and degassed ACC.

Geoffrey Frost

The Use of Mobile Water Treatment Equipment to Supply Supplemental High Purity Water during Commissioning at Millmerran

Large volumes of high purity water are required during power station commissioning for the critical tasks of boiler hydrotesting, chemical cleaning and steam blows. As with most new stations, the permanent water treatment plant at Millmerran was sized for normal operating conditions and could not supply the quantity of high purity water required for the commissioning program. To resolve this situation a mobile water treatment plant, provided by Ecolochem, produced a supplemental flow of up to $30 \text{ m}^3 \cdot \text{h}^{-1}$ of high purity water on a continuous basis over a period of six months from March to September 2002. The conductivity of the supply water to the mobile plant ranged from $1\,700$ to $2\,700 \mu\text{S} \cdot \text{cm}^{-1}$ and it was a major challenge to achieve the final treated water quality targets of $0.1 \mu\text{S} \cdot \text{cm}^{-1}$, $10 \mu\text{g} \cdot \text{L}^{-1} \text{SiO}_2$ and $100 \mu\text{g} \cdot \text{L}^{-1}$ total organic carbon. This paper discusses the design and operation of the mobile water treatment plant used at Millmerran and how various operational problems were overcome during the project.

Jenny Lindsay

Loy Yang Power – Cooling Tower Chemical Dosing Implementation: Practical Findings

From early 2001, GE Betz were given the opportunity to treat the Loy Yang Power Station cooling water systems to control microbiological activity and corrosion of the copper-based metallurgy in those systems.

After commencing with continuous dosing of sodium hypochlorite as the biocide and the traditional tolyltriazole (TTA) as the copper corrosion inhibitor, the treatment program was optimised over the next year of operation. Sodium hypochlorite efficiency was determined by monitoring of both *Legionella* and total bacteria to determine the effectiveness of the biocide program and by using oxidation reducing potential to measure on-line the activity of the biocide. Copper corrosion inhibitor efficiency was determined using the on-line linear polarisation resistance technique (Corrator), corrosion coupons and by measuring copper concentrations in the recirculating cooling water.

The optimisation process concluded that to meet the key performance indicators for control of microbiological activity the most cost effective water treatment program was to use intermittent dosing of sodium hypochlorite. Further optimisation of the sodium hypochlorite consumption was achieved by proactively adjusting the dosage rate by taking into account the historical microbiological activity results. This proactive altering of the dosage rate of the sodium hypochlorite resulted in extra dosage occurring when the ambient temperature increased, i.e., in the hotter summer months, and a reduced dosage being required in the cooler winter months.

The traditionally used copper corrosion inhibitor, TTA, was found to be unable to control corrosion to meet the key performance indicators at cost effective dosage rates when the higher levels of sodium hypochlorite dosage were being applied, which resulted in the introduction of the halogen resistant azole (HRA) as an alternative to TTA. HRA provided an immediate improvement in copper corrosion and whilst there is still a requirement to adjust the HRA dosage as the level of sodium hypochlorite is increased, this optimisation process has shown the HRA to be a more effective copper corrosion inhibitor than TTA.

Albert Bursik

Utility Management vs. Power Plant Chemistry – A Defense Counsel's Summation

Over the last two decades, the number of power plant chemists in fossil utilities – not to mention industrial steam and power generation – has dramatically decreased. In this paper, an attempt is made to find out the reasons why utilities in general underestimate the role of plant cycle chemistry. It seems that shortsighted economic evaluations disregarding the long-term aspects entice the utility management to decide against plant cycle chemistry with respect to manpower and costs.

It is felt that chemists in utilities play a part in their not very high valuation. Some examples are given demonstrating how a chemist can contribute to his poor appraisal. To improve the chemist's position in a utility, benchmarking of cycle chemistry and chemistry's function in an organization on a regular basis is advantageous.

For utilities, it is shown that being concerned with plant cycle chemistry and establishing conditions which make achieving or maintaining the "World Class" category in plant cycle chemistry possible pays. For this reason, providing utility chemists with adequate funds and carrying out regular cycle chemistry audits, peer reviews, or benchmarking actions helps in ensuring optimum plant cycle chemistry and optimum operation and maintenance costs.

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