

Abstracts

Mirosław Gruskiewicz, David B. Joyce, Simon L. Marshall, Donald A. Palmer and John M. Simonson

The Partitioning of Acetate, Formate, and Phosphates around the Water/Steam Cycle

Volatilities of formic acid, acetic acid, sodium acetate, phosphoric acid, sodium dihydrogen phosphate and sodium monohydrogen phosphate have been measured at temperatures up to 350 °C using a corrosion-resistant static cell with sampling of both phases.

Thermodynamic liquid-vapor partitioning constants were evaluated as functions of temperature and water density using available information on the activity coefficients and association behavior. The results show that at very low concentrations the salts are much less volatile than the acids, but as the sodium concentration and pH increase, their contributions may be significant. The software used to predict compositions around the steam cycle has been revised and extended to 19 species in the liquid phase and 19 species in the vapor phase. Example calculations using the cycle chemistry program are discussed. For boilers operated at 350 °C, the mechanical carry-over is likely to be the main source of phosphates in the steam. The concentrations of phosphoric acid and sodium phosphates in the liquid phase, which are relevant to the "phosphate hideout" phenomenon, can be calculated as a function of pH.

Otakar Jonas, William Steltz, and Barry Dooley

Steam Turbine Efficiency and Corrosion: Effects of Surface Finish, Deposits, and Moisture

This paper presents the main results of a recent EPRI project in which the effects of surface finish, deposits, and moisture on steam turbine efficiency were evaluated. The experimental part of the project included field testing of the effect of surface finish on deposition in fossil LP and HP turbines. It is shown that all of the above areas can significantly influence turbine performance.

Karl-Franz Hahn and Hans-Günter Seipp
Layup Measures during Shutdowns for Turbogenerator Sets and Water/Steam Cycles in Large Utility Plants

Inadequate layup of plant cycle components or whole plant cycles results in a considerable corrosion that as a damage precursor may cause serious damage to cycle components during operation. Such phenomena are naturally as more pronounced as more often the unit is shut down and the duration of a relatively harmless short-term shutdown is exceeded. Layup measures for intermediate and long-term shutdown that should ensure corrosion-free unit conditions require detailed planning. Using a layup concept for a large turbogenerator set, proven layup measures are demonstrated. The presented exemplary actions have in particular cases guaranteed corrosion-free layup over several months up to several years.

Michael A. Sadler
Ammonium Form Operation of Condensate Polishing Plants – Position and Possible Developments

Ammonium form operation of condensate polishing plants is a technique that offers both useful operating economies and a significant reduction in the amount of regenerant waste requiring disposal. It has been used since the 1960s and the advantages and disadvantages associated with its use are described in the technical literature. Ammonium form operation is used successfully by a number of power stations with their polished water qualities being comfortably within all advised targets and the stations obtaining long service runs from their polisher beds. However, there are disadvantages associated with its use and it is not suitable for all power stations. The Electric Power Research Institute recently undertook a review of the procedure. As a result of this, they have now issued Guidelines to assist stations in deciding whether ammonium form operation could usefully be adopted and also to guide stations already using the technique. Possible developments that could aid its use are also discussed.

Jayappa Manjanna and Gopala Venkateswaran Preparation and Dissolution of La-, Ce- and Zr-Containing Magnetites in CEA Mixtures

If fission products such as lanthanum, cerium, and zirconium are present in corrosion product deposits of primary systems of nuclear reactors, then this can lead to an increased radiation field buildup. The minimization of such an activity buildup is normally done by a *chemical decontamination process* involving the dissolution of this oxide deposit (corrosion product, Fe_3O_4). Thus, the dissolution behavior of oxides of lanthanum, cerium, and zirconium in magnetite (equivalent to 1 metal at.% in magnetite) in citric acid-EDTA-ascorbic acid mixture is reported in this study. The oxides employed are prepared synthetically by a co-precipitation method and characterized by using X-ray diffraction, Fourier transform infrared spectroscopy, transmission electronic microscopy, atomic absorption spectroscopy, energy dispersive X-ray analysis, and Brunauer-Emmett-Teller surface area measurements. The addition of cerium during the preparation of magnetite resulted in a decreased particle size and hence in an increased surface of the oxide irrespective of the presence of lanthanum and zirconium. The dissolution behavior of magnetite was not affected by the presence of the fission products lanthanum, cerium, and zirconium at 1 at.% each, either individually or in combination. A dissolution rate coefficient of $3 \times 10^{-3} \text{ s}^{-1} (\text{k}^1)$ and a γ value of 1.3 was obtained by applying general kinetic equation, while using inverse cubic rate law, k_{obs} was found to be $5.16 \times 10^{-4} \text{ s}^{-1}$. When the amount of the metals was ≥ 3 at.%, a turbidity was observed during the dissolution, which could be removed by filtration.

VGB Conference "Chemistry in Power Plants 2001" – Extended Abstracts

This contribution contains extended abstracts of all papers presented at the VGB Conference "Chemistry in Power Plants 2001" (seventeen plenary papers, six papers of the section "Nuclear Power Plant Chemistry", and six papers of the section "Flue Gas Cleaning").

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