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APPLICATION OF THE RIETVELD METHOD TO THE ANALYSIS OF XRD DATA OF CORROSION DEPOSITS FORMED IN EQUIPMENT PARTS OF REFINERIES AND GAS PLANTS

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ABSTRACT

This article reports the application of the Rietveld method to the quantitative analysis of corrosion deposits whichis certainly an important industrial application, and an educational paper on the analysis of such deposits is worthwhile. The basic premise of this paper - that crystallographic preferred orientation can affect the results of a quantitative analysis - is important, and worth discussing. Examples of (i) structure, texture characterizationand quantitative analysis of iron oxide corrosion products from the boiler tube equipment in gas plant in the form of magnetite [Fe_3O_4], hematite [Fe_2O_3], goethite [FeO(OH)], and formation material normally found in the sandstone or sand in the form of quartz [SiO_2] and (ii) quantitative phase analysis of synthetic mixtures of barite, quartz and hematite and (iii) quantitative phase analysis of sludge deposits that were collected from the equipment parts in a refinery, which are very useful in quantitative phase analysis by Rietveld method.Key information is not just the phase concentrations, but the lattice parameters (which can reflect composition) and information derived from the profile parameters and the preferred orientation. All aspects of the microstructure are worth discussing. Magnetite and hematite are especially prone to the preferred orientation, and so would be worth including in the samples discussed. Knowing accurately which phase are involved along with the structure, texture and compositions for each of the identified phases in the scale formation and corrosion deposits can guide the field engineers at the refinery and gas plants to facilitate the efficient cleaning of the equipment by drawing up the right procedures and taking preventive action to stop the generation of those particular deposits.

KEYWORDS: *Rietveld Method, XRD, Texture, Quantitative Phase Analysis, Structural Refinement*