Corrosion of Copper in Sulfuric Acid under γ-ray Irradiation

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Abstract

In order to illustrate the corrosion behavior of metals under radiation, we undertook a systematic study of the corrosion of pure metals in mineral acid under γ-ray irradiation. In this paper are presented the results of experiments on the corrosion of copper in sulfuric acid. Irradiation cells containing sulfuric acid in the desired concentration in which pure copper plate is immersed is irradiated with a Co–60 γ-ray source, the specimen is hauled up from the sulfuric acid and weighed to determine the weight loss; if necessary, the surface of the specimens are examined photographically, or by the X-ray or electron diffraction method, and the corrosion products are chemically analysed. The test results are compared with those of reference runs conducted under the same conditions minus irradiation. The results are as follows: (1) Effect of radiation is pronounced above the total dose of 10^7r. (2) The loss of weight becomes greater with the higher acidity up to 5N and then decreases, reaching a minimum at 20 N. But in concentrated sulfuric acid, it is remarkable and a dark green corrosion product is precipitated which is assumed to be composed of CuS. (3) The effect of radiation is mainly due to the decomposition of sulfuric acid but not to the influence on the nature of the metal itself. (4) The above results are discussed from the standpoint of the radiolysis of sulfuric acid solution.

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