World Academy of Science, Engineering and Technology
International Journal of Nuclear and Quantum Engineering
Vol:10, No:12, 2016

Studies on the Spontaneous Reductive Decomposition Behavior of Permanganate in the Water

Authors : Hyun Kyu Lee, Won Zin Oh, June Hyun Kim, Jin Hee Kim, Sang June Choi, Hak Soo Kim

Abstract : The oxidative dissolution of chromium oxide by manganese oxides including permanganate have been widely studied not only for the chemical decontamination of nuclear power plant, but also for the environmental control of the toxic chromate caused by naturally occurring manganese dioxide. However, little attention has been made for the spontaneous reductive decomposition of permanganate in the water, which is a competing reaction with the oxidation of the chromium oxide by permanganate. The objective of this study is to investigate the spontaneous reductive decomposition behavior of permanganate in the water, depending on the variation of acidity, temperature and concentration. Results of the experiments showed that the permanganate reductive decomposition product is manganese dioxide, and this reaction accompanies with the same molar amount of hydrogen ion consumption. Therefore, at the neutral condition (ex. potassium permanganate solution without acidic chemicals), the permanganate do not reduce by itself at any condition of temperature, concentration within the experimental range. From the results, we confirmed that the oxidation reaction for the permanganate reduction is the water oxidation that is accompanying the oxygen evolution. The experimental results on the reductive decomposition behavior of permanganate in the water also showed that the degree and rate of permanganate reduction increases with the temperature, acidity and concentration. The spontaneous decomposition of the permanganates obtained in the studies would become a good reference to select the operational condition, such as temperature, acidity and concentration, for the chemical decontamination of nuclear power plants.

Keywords : permanganate reduction, spontaneous decomposition, water oxidation, acidity, temperature, permanganate concentration, chemical decontamination, nuclear power plant
Conference Title : ICNSSE 2016 : International Conference on Nuclear Systems Science and Engineering
Conference Location : Rome, Italy
Conference Dates : December 08-09, 2016