Calculation of Iodine Crystallizer Heat Duty for Sulfur-Iodine Cycle of Hydrogen Production

이준규, 강정원[1], 박병흥*
한국교통대학교; [1]고려대학교
(b.h.park@ut.ac.kr*)

The continual increase in energy demand, the gradual decrease in fossil fuel supplies, and the environmental pollution associated with their use have attracted the attention of researchers in search for new energy alternatives. Hydrogen is an attractive fuel as a clean and flexible energy carrier. Currently, most hydrogen is produced from multiple energy sources, e.g. reforming of natural gas, electrolysis of water, etc. One of these is Sulfur-Iodine cycle(S-I cycle), in which water is split into H_2 and O_2 through chemical reactions that driven by high temperature from a utility of a nuclear reactor. The process is composed of three distinctive sections and one of them is HI decomposition into H_2 and I_2 named as Section III. The production of H_2 involved some processes including EED for concentrating a product stream from Section I. Furthermore, an I_2 crystallization step would be considered to reduce burden on EED by removing some of I_2 out of a stream prior to EED. In this work, electrolyte-NRTL model was adopted to generate phase equilibrium behavior of Section III. This model described experimental data with decent accuracy. We calculated temperature and heat duty of an I_2 crystallizer using the model and heat balance equation. Therefore, we obtained results of solid-liquid phase composition and relations between the temperature and the heat duty. The results were expected to be used as operation information in optimizing the entire process and setting up material balance throughout the S-I cycle.