

Thermal Analysis of a Iodine Crystallizer in a SI Thermochemical Water Splitting Process

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SI water splitting process is considered as a promising technology for massive hydrogen production. The process is composed of three main parts named as Section I, II, and III. In Section I where Busen reaction take places, excess amount of I_2 is introduced to separate reaction products. Therefore, the unreacted I_2 is accompanied with HI and sent to Section III where HI is decomposed to generated hydrogen. In order to reduce burden and increase efficiency on Section III, the I_2 should be removed from a process stream and recycled to Section I.

A crystallization process is developed to separate I_2 prior to introduction of a product stream from Section I to Section III. A semi-continuous vertical crystallizer was devised to obtain I_2 rich phase as a bottom stream. The crystallizer utilizes axial temperature gradient.

In this work, thermal analysis of the device was performed by using a commercial analysis tool. The variation of thermal conductivity was considered by Rowley method incorporating electrolyte-NRTL excess Gibbs energy parameters reported by UVa model which was a proven and suitable model for describing phase behavior of Section III.