

SI process using permeable membrane

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The Sulfur-Iodine thermochemical cycle offers a promising approach to the high efficiency production of hydrogen from nuclear power. Several SI cycles had been proposed by several research group. General Atomic (GA) studied I₂ separation by extractive distillation using H₃PO₄. RWTH introduced the concept of reactive distillation. HIx stream coming from the Bunsen reaction is fed to the column. And HIx is distilled and decomposed at the same time to obtain hydrogen. Korea Institute of Energy Research (KIER) and Japan Atomic Energy Agency (JAEA) concentrate HIx using electro-dialysis cell and concentrated HIx is fed to the column to produce HI vapor, which is decomposed to produce hydrogen. HI was separated from HIx solution by an extractive distillation using H₃PO₄. However, a large amount of electric energy was required to recycle H₃PO₄. Most of SI processes have difficulties producing hydrogen because it has excess iodine in HI decomposition Section. SI cycle with electro-dialysis cell uses membrane reactor to separate H₂ and HIx. The current state of the membrane technology is not compatible with the process needs.

We studied several cases of flowsheets to overcome the problems mentioned above. We revised the flowsheet by adding the iodine separator and excluded membrane reactor. We analyzed the thermal efficiency of SI process based on revised flowsheet.