

Assessment of kinetic behavior and separation capacity of HFC-152a hydrate-based desalination using an experimental measurement and a thermodynamic correlation

목정훈, 최원중¹, 서용원^{1,†}

UNIST; ¹unist

(ywseo@unist.ac.kr[†])

Hydrate-based desalination (HBD), a type of freezing-based desalination, can produce clean water via hydrate formation. Previously, low energy efficiency was considered a critical disadvantage of this technology, but with the recent proposal of a high-efficiency process using cold energy of LNG, the economic feasibility of HBD have been re-evaluated. In this study, growth behavior and desalination capacity of HFC-152a HBD were investigated by comparing them with those of HFC-134 HBD. The faster formation kinetics and higher extent of the hydrate conversion were observed for the HFC-152a hydrate despite the smaller initial driving force. In addition, to quantify the desalination efficiency of HFC-152a HBD, the maximum achievable salinity and maximum water yield were examined by employing a Hue-Lee-Sum correlation. The efficiency of salt-enrichment and water recovery decreased with an increase in the initial salinity and increased with increasing the subcooling. The overall results indicate that HFC-152a is a better candidate for HBD than HFC-134a. The novel approach suggested in this study will be useful for evaluating the desalination efficiency of the HBD process.