HTU dependence on an Isotope Species Experimental Study on "EVIO" Pilot Plant

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LPCE process study is going on in PNPI RAS on "EVIO" pilot plant.

The strong dependence of Height of Transfer Unit (HTU) on temperature was obtained experimentally earlier [1]. The dependence was explained in the context of process model, which deals with three flows (liquid water, water vapour and hydrogen gas), by effect of temperature on the value of vapour flow – latent intra-column vehicle flow. HTU is a product of standard approach which ignores the vapour flow crucial role [2]. That is why HTU can suffer and from other factors. The effect of separation factor value, or in other words: HTU dependence on deuterium concentration and an isotope species – is of especially interest. For instance, the following practical question arises: can one validate the use of HTU value obtained for system D-H in the evaluation of separation column height for system D-T?

Separation performance in systems deuterium-protium and deuterium-tritium was studied experimentally within one run of exchange column. This study was of interest from practical point of view also: deprotiation and detritiation of heavy water on "EVIO" pilot plant.
So called "schema with independent incoming flows" was used to reach steady state quicker. The ratio of incoming flow values and the content of isotopes of interest in the flows were chosen in that way to get reliable measurement of outgoing concentrations on conditions that these concentrations are removed enough from equilibrium (limit) ones.

Experimental results are presented and discussed in comparison with computer simulation's dependences.

References

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2. Fedorchenko O.A., Alekseev I.A., Uborsky V.V. Water-Hydrogen Isotope Exchange Process Analysis. Fusion Science and Technology, 2008, 54, p. 450.