

MAIN FUNCTIONAL CHARACTERISTICS PREVISION OF SIMPLE CRYOGENIC DISTILLATION COLUMN FOR HYDROGEN ISOTOPES

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Abstract

In this paper a simulation procedure for simple column of hydrogen isotope separation by cryogenic distillation method is used to analyze the influences of two principal theoretic parameters - reflux ratio and number of stages. It is determined the optimum of both parameters for real input data of cryogenic distillation column.

Keywords: hydrogen, isotope, cryogenic, distillation, simulation, reflux ratio, stages.

1. Introduction

As part of a real simple column design of the hydrogen isotope separation by cryogenic distillation method it has in view two principal technical criterions: optimum of diameter and height. For the beginning, scientific prognoses of both column characteristics require an exact simulation model. This model is presented in a separate study. Here it is used to establish the influences of the principal parameters on separation characteristics of distillation column.

2. Method and samples

In the beginning it was determined the domain of application for the simulation procedure of simple cryogenic distillation column. This has tested for the variation of input variables. It is estimated that the procedure is applicable and effective in such cases that the cut of mixture of each stage is prescribed and require being independent of concentration; the stage separation factors are given as input variables in large limits. Afterwards we have run the routine with the variation of several input principal parameters one by one. It had in view to determine the dependence of the principal column characteristic - molal fraction of tritium (T) on top stream - from the considered input parameter.

3. Results and Discussions

The effects of pressure drop have been found not significant. The optimum value of reflux ratio and number of total theoretical stages must be determined to avoid unnecessarily

large value of inner diameter and packed column height, respectively. Figure 1 and 2 shows the relation between these two parameters and the performance of the simple column.

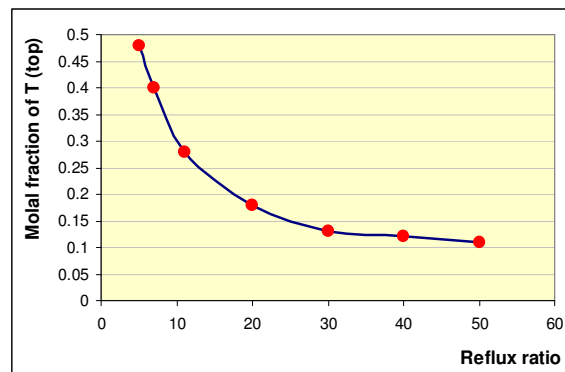


Fig. 1. Effect of reflux ratio

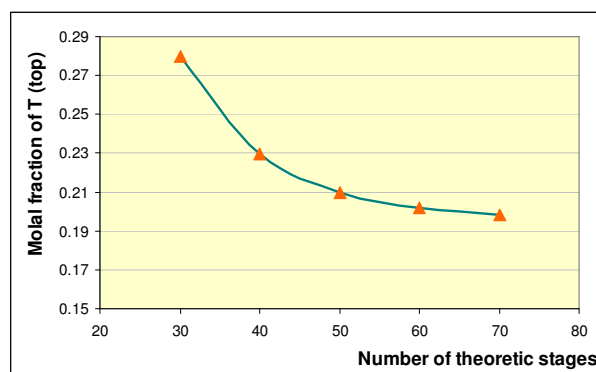


Fig. 2. Effect of number of total theoretical stages

4. Conclusions

All the considerations have provided the theoretical optimum for simple cryogenic distillation column: - number of total theoretical stages = 70; (- feed location = 35;)
 - reflux ratio = 27 g- mol/h.

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