STUDY OF ISOTOPIC EXCHANGE BETWEEN HYDROGEN AND WATER USING HYDROPHOBIC *Pd* CATALYST

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An isotopic exchange process between gaseous hydrogen and water

$$HTO + H_2 = H_2O + HT$$

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has a very high value of a separation factor α in the field of practically accessible temperatures (298–343 K) and takes place on a hydrofobic catalyst with noble metals. An interest to the process is owing to its possible application in detritiation and deprotization plants, which can be also used for heavy water wastes reprocessing and recovery of the radioactive tritium [1,2].

We have carried out studies of mass exchange characteristics of the catalyst — 4% *Pd* on a specially hydrophobized carbon material "sibunite" — in $HTO - H_2$ system. Catalyst was prepared in Institute of Catalysis of the Russian Academy of Science, Novosibirsk.

The experiment has been carried out on an apparate with independent gas and liquid streams at atmospheric pressure. We studied a dependence of the catalyst activity (of the mass transfer coefficient in the gaseous phase K_{oy} and the value of number of transfer units NTU) on specific gas (G_{sp}) and liquid (L_{sp}) loading in the temperature range 303-353K at the atmospheric pressure. The stability of the catalyst during time of work was also studied [3].

Figure 1 shows the relation between NTU values and specific gas loading (G_{sp}) at various temperatures. Figure 2 presents the Arrenius plot ln K_{oy} and NTU, which has been used for determination of energy activation value.

The value of NTU increases with an increase in qas loading at constant temperature and remains constant by change of the liquid flow and increases with the temperature lowering.

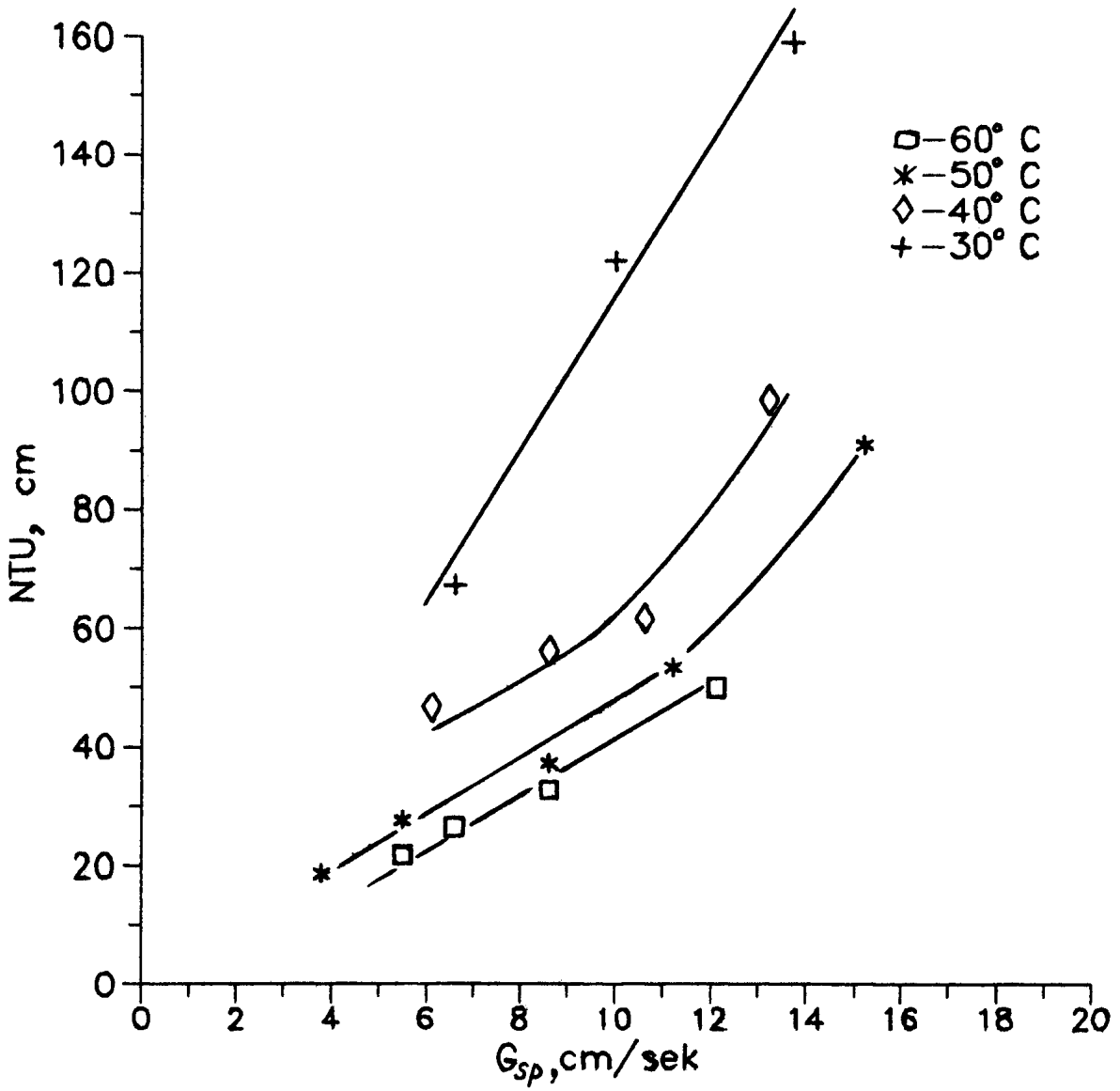

Fig.1. Relation between number transfer unit (NTU) and gas specific loading (G_{sp}) by various temperatures

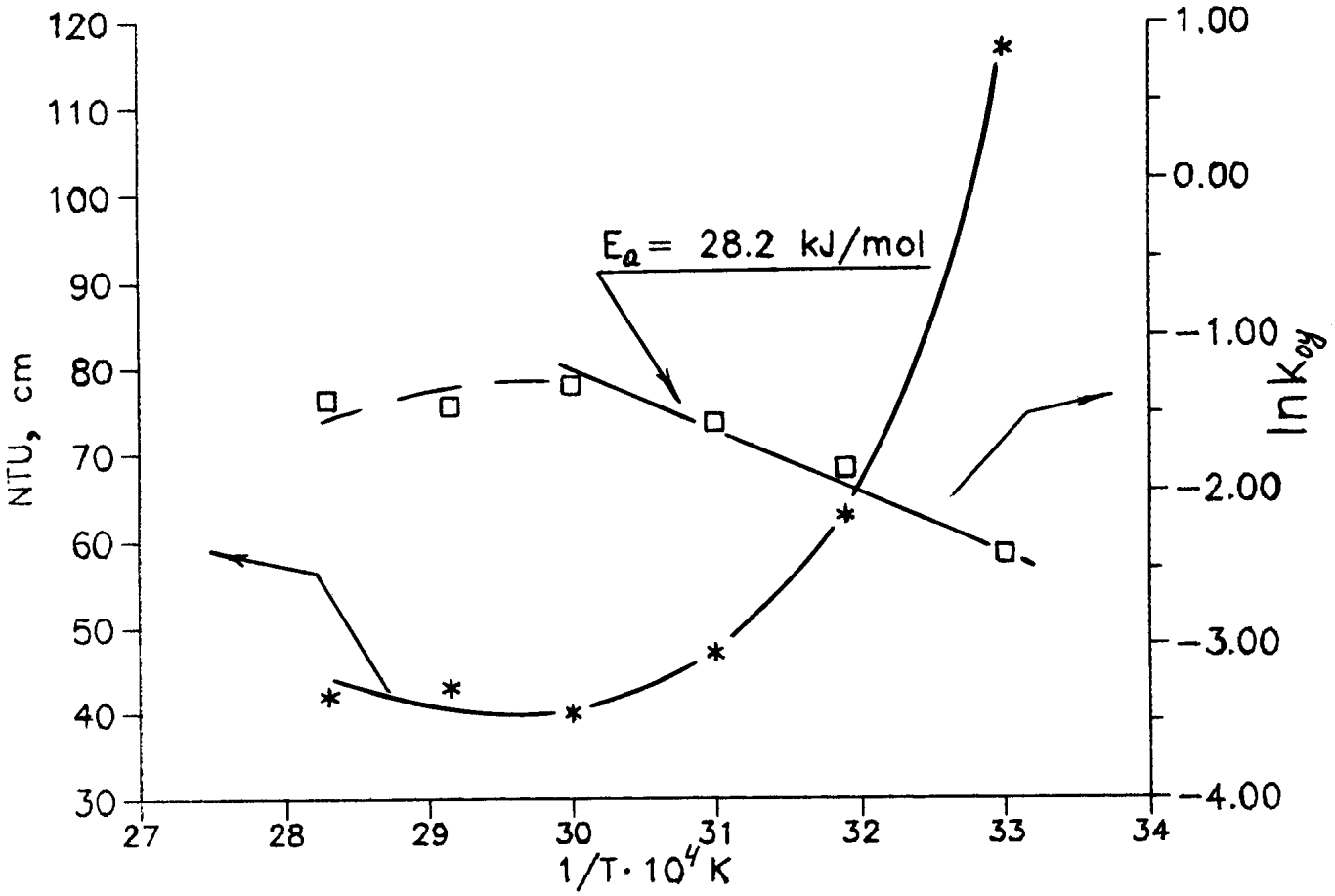

Fig.2. Temperature dependences mass transfer coefficient and number transfer unit (NTU) by $P = 0.10$ mPa and $G_{sp} = 0.10$ m/c

The catalyst shows a good activity only in the region of small gas loading and high temperature. Value of energy activation in the temperature range 303–333 K – $E = 28,2$ kJ/mol — testify about process proceed in the transient region. The main contribution in the limit stage of the process appeares to have the exchange reaction.

REFERENCES

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