SYNTHETIC ACTIVATED CHARCOAL TYPE OF SKN-2K STUDY FOR THE HYDROGEN ISOTOPES HIGH CLEANING

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The problem of search for and study of new types of adsorbents to be used in installations containing hydrogen isotopes mixtures remains actual now, since well-known commercial adsorbents don't meet in many respects the strict requirements being layed to these installations.

Charcoal type of SKN-2K, synthesized for medical application, is attractive first of all by its high mechanical durability and greatly developed porosity.

In LNPI hydrogen isotopes separation laboratory SKN-2K charcoal study hadbeen carried out in order

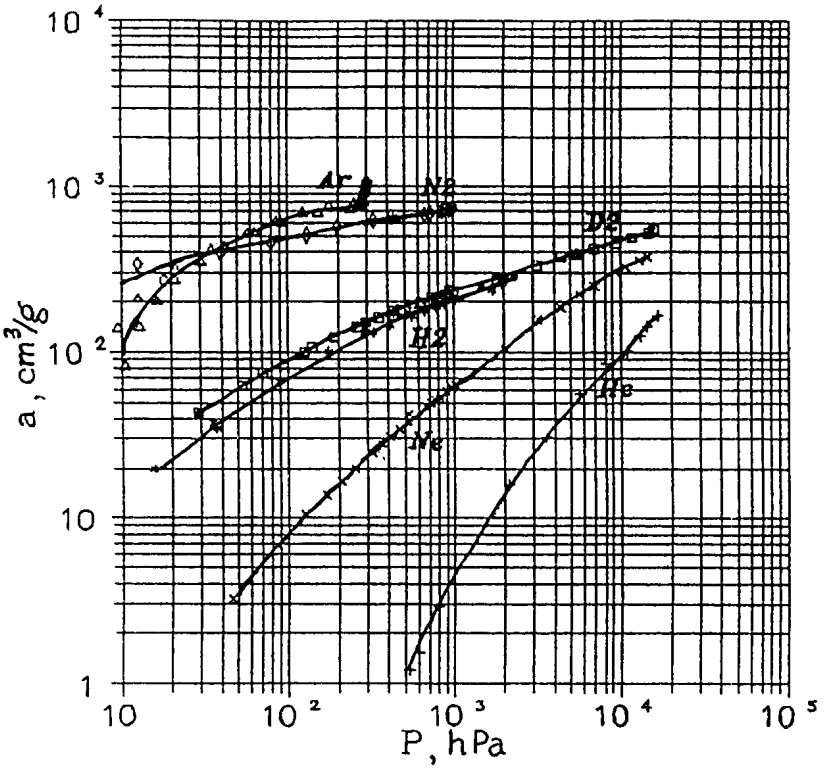

Fig. Adsorption isoterms of argon, nitrogen, neon, helium,hydrogen, deuterium on SKN-2K charcoal at T=78 K.

to analyze its applicability in reactor PIK deprotization and detritiation plant, where the high cleaning of hydrogen isotopes mixture flow from nitrogen and oxygen impurities is required (up to 10^{-7}% *vol.* of impurities).

The study resulted in determination of SKN-2K charcoal adsorption properties at the temperature of 78K concerning cryogenic gases:N_2, Ar, Ne, He, H_2,D_2 (see fig.1); determination of separation factors of H_2—HD, HD—D_2,H_2—D_2, H_2—HT hydrogen isotopic forms, being equal 1.1 ± 0.06, 1.13 ± 0.08,1.24 ± 0.06, 1.24 ± 0.02, respectively; study of dynamic characteristics duringH_2(D_2) cleaning from nitrogen impurity.

Compared to other adsorbents (SKT-4, PAU, etc.) SKN-2K charcoal possesses higher adsorption capacity to nitrogen and argon, at the same time its capacity to hydrogen isotopes being lower, that makes it more advantageous for application in purification of poor adsorbable gases from N_2 and O_2 in comparison with now commonly used charcoal type of SKT-4.

Dynamic characteristics of SKN-2K charcoal are much better than those of this class adsorbents and better than those of silica gels and zeolites, conditions being equal. Thus, the zone of main mass-exchange (L_0) during hydrogen cleaning from nitrogen impurity under the conditions:

nitrogen input concentration - 0.12% *vol.*,

gas velocity in adsorber - 1.9 *cm/s*,

according to [1] for charcoal type of SKT L_0=27 *cm*, for zeolite type of NaX L_0=13 cm, while for SKN-2K charcoal its value is 2.4 cm. Under the conditions close to commercial, the influence of pressure, initial gas purity, gas velocity in adsorber, adsorbent preliminary preparation upon efficiency of hydrogen isotopes adsorption cleaning process has been studied. Purification process optimum conditions are determined. The techniques of hydrogen isotopes adsorption cleaning from nitrogen and oxygen microimpurities on SKN-2K and SKT-4 charcoals are developed, allowing to reduce impurities concentration at cleaning adsorber exit to 10^{-7} *vol.*, and to increase purfication efficiency.

Reference

1. Keltsev N.V. Adsorption engineering foundations. M., Chimia. 1984.