

Carbon molecular sieves in the analysis of light gases

© Vladimir V. Shcherbakov,¹ Sergey V. Prokopov,²

Elena I. Demchenko,¹ and Svetlana V. Kurbatova^{1*+}

¹ Physical Chemistry and Chromatography Division. Samara State Aerospace University Named after Academician S.P. Korolev (National Research University). Academic Pavlov St., 1. Samara, 443011. Russia. Phone: +7 (846) 334-54-32. E-mail: curbatsv@gmail.com

² OOO NTF "BAKS". pr. Kirova, 22. Samara, 443022. Russia.

*Supervising author; +Corresponding author

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Abstract

The results of the study of using domestic carbon sorbents in the analysis of light gases are presented. It is shown that the main drawback of the zeolites traditionally used for these purposes is their ability to absorb moisture, leading to a significant decrease in the separating ability. Irreversible sorption of acid gases eliminates the possibility of using zeolites in the analysis of such compounds. The characteristics of carbon molecular sieves (CMS), which are low-polar microporous hydrophobic sorbents on the basis of carbon with a large specific surface, are devoid of the disadvantages inherent in zeolites. It is shown that the essential advantages of CMS in comparison with zeolites are high hydrophobicity, due to which they do not saturate with moisture and do not require periodic regeneration, chemical inertness leading to the possibility of their use for the analysis of acid gases and polar compounds, as well as stability at high temperatures. It is noted that, at the same time, the problem of their application is reduced selectivity to nitrogen and oxygen and some difficulties of use in industrial stream analysis, and therefore the use of unmodified materials is often unprofitable. In the paper, the characteristics of several varieties of CMS made from the Anthracites of the Listvyanskoye Kuzbass deposit by the Sorbent Kuzbass LLC have been investigated, the sorption properties of which have been compared with the Carbosieve S-II sorbent from Supelco-Agilent. The selectivity of CMS to hydrogen, helium, methane, and other light gases was studied using the verification gas mixtures of various compositions. The influence of the column temperature and the velocity of the carrier gas on the separation of the components of mixtures of light gases was studied.

References

- [1] A.V. Berveno, V.P. Berveno. *Polzunovsky Vestnik*. **2011**. No.4-1. P.200-202. (russian)
- [2] A.G. Shchurig. Artificial carbon materials. *Perm: Iskra*. **2009**. 342p. (russian)
- [3] A.V. Berveno, V.P. Berveno. *Physicochemistry of the Surface and Protection of Materials*. **2009**. Vol.45. No.4. P.411-414. (russian)
- [4] M.B. Alekhina. Industrial adsorbents. *Moscow: Science*. **2013**. 386p. (russian)
- [5] A.V. Berveno, V.P. Berveno. *Polzunovsky Vestnik*. **2008**. No.3. P.84-87. (russian)
- [6] A.A. Yurkevich. Chemistry and technology of adsorbents, chemisorbents and low-temperature oxidation catalysts. *St. Petersburg: IK Synthesis*. **2001**. 174p. (russian)