

Sorption of hydrogen by quartz aerogel at low temperatures

**R.M. Basnukaeva¹, A.V. Dolbin¹, M.V. Khlistyuck¹, V.B. Esel'son¹,
V.G. Gavrilko¹, N.A. Vinnikov¹, V.E. Martsenuk², N.V. Veselova²,
I.A. Kaliuzhnyi², A.V. Storozhko³**

¹ *B. Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine, 47 Nauky Ave., Kharkov 61103, Ukraine.*

² *National Technical University "Kharkiv Polytechnic Institute", Kharkov, Ukraine*

³ *V.N. Karazin Kharkiv National University, Kharkov, Ukraine*

The sorption and subsequent desorption of hydrogen gas by quartz aerogel [1] sample has been investigated in the temperature range 7–95 K by method of thermo-programmed desorption. In whole temperature range of the studies, physical sorption of hydrogen by the sample was observed, due to the weak van der Waals interaction of hydrogen molecules with quartz pore walls of the sample. The total capacity of the aerogel sample with due to hydrogen was ~ 1.5% by mass. It is determined that as the temperature of the sample decreases from 95 to 60 K, the characteristic times of hydrogen sorption by quartz aerogel increase, which is typical for thermally activated diffusion ($E_a \approx 408$ K). In the temperature range 15–45 K the characteristic times of H₂ sorption weakly depended on temperature, which is presumably due to the predominance of the diffusion tunneling mechanism over the thermoactivation mechanism. Below 15 K the characteristic sorption times increase with decreasing temperature, which can be explained by the formation of a monolayer of H₂ molecules on the surface of aerogel grains.

1. *Woignier T., Primera J., Alaoui A., Etienne P., Despestis F., Sylvie Calas-Etienne. Mechanical Properties and Brittle Behavior of Silica Aerogels // Gels. – 2015. – V. 1, P. 256-275*