EXPERIMENTAL STUDY OF THE DENSITY OF THE GAS SYSTEM HELIUM-NITROGEN-NEON AT LOW TEMPERATURES.

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At the Department of TOT (Department of Theoretical Foundations of Heat Engineering) was created an experimental installation to measure the density of the ternary gas system helium-nitrogen-neon at temperatures of 100 – 300 K and pressures up to 16 MPa. The installation implemented a method of a piezometer of constant volume. The mixtures were prepared from pure gases-components. The purity of nitrogen to 99.999 vol.%, helium – not less than 99,993 vol.%., neon – 99,999 vol.%. The unit consists of three main components – a mixer, a piezometric cell and a gasometer. The amount of substance in the piezometer was determined by the volumetric method – with the help of the gasometer. The temperature in the main units of the plant was measured using platinum thermometers of the TSPN-1 and PTS-10 types and potentiometer of the R-348 and R-363-2 types. Pressure – with the help of pressure transducers type IPDC and a set of U-shaped pressure gauge and catheter type B-630. The piezometer has a ballast volume at variable temperature. The temperature field of this volume was measured using copper-constantane thermocouples. Cryostatization of the piezometric cell is carried out with gaseous nitrogen, obtained by boiling liquid nitrogen in the Dewar-flask. The temperature control system in the piezometer is based on the temperature controller of the type VRT-3, the sensing element in it uses a copper resistance thermometer. The quality of regulation was ±0,005 K. The vessels of the mixer and the gasometer were thermostated in two liquid thermostats at room temperatures. The accuracy of the measurement of the density of the mixture, the facility assessed: a maximum of 0,3 – 0,6%; probability of 0.1 – 0.2% (with confidence interval of 0.95).

In the experiment, three mixtures with molar concentrations (xHe/xNe) were prepared): 0,33/0,33; 0,16/0,24; 0,24/0,59. A series of experimental isotherms was obtained: 100 K, 115 K, 125 K, 140 K, 190 K, 250 K, 294 K.

For this ternary system, the only experimental work was found in the open access [1].

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1. Robert J. Burch, Low Temperature Phase Equilibria of the Gas-Liquid System Helium-Neon-Nitrogen. J. Chem. Eng. Data, 1964, 9 (1), pp 19–24.