The pressure in volume VD determines the outlet of cooling gas. The operating program is provided for minimization of the outlet of cooling gas by means of variation of four parameters:

1. The pressure in volume VD
2. Cooling upper and lower flanges
3. Heating upper and lower flanges
4. Regulation of gas flow.

The program is written in PASCAL. There is a possibility to control the level of liquid Helium in volume VD by means of the levelmeter LS, the pressure in VD by the pressure-meter PS and gas temperature by means of transducer TS2 and digital voltmeter DV. The pressure is throwed off by the emergency valve V3. The manual controlled valves V2,V4,V6,V7 are used for the changing the volume VD.

Operating characteristics of system:

1. Operating temperature interval 30 - 400 K
2. Relative control accuracy of gas temperature + 0,07 K per day duration
3. The temperature difference between upper and lower flanges of chamber 0,1 K
4. Absolute accuracy measurement of temperature + 0,15 K.

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THE ABSORPTION METHOD AND SETUP OF HIGH-PURITY ETHANE PRODUCING

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Introduction

An implementation of gas detectors such as drieft chambers (DC) [1,2] in experimental high energy physics is gaining acceptance. The quality of its operating in many respects is determine by a parameters of gas mixture and presence of impurities (especially electricaly negative one).

It is well known [1,2] that a choosing of gas mixture in DC is a sufficiently difficult problem which is determined both by the experimental conditions and properties of gas. Usually on deciling of optimal gas mixture the mine characteristics of gas (electron drieft velosity,gas gate, diffusion coefficients, an electron affinity etc.) are taken into account. Moreover the cost and availability of gas are taken into consideration also. Very so often a gas mixture based on Argon with different organic admixture are used under operating of DC. Argon

as a noble gas has a zeroth electron affinity and permits to obtain a high multiplication coefficient. As regards organic admixture (methane, ethane etc.) in Ar, they possess by quenching properties and reduce secondary electron emission from cathode.

In view of elaboration and further operation of "PHENIX" drift chambers [3] there was a need to resolve a problem of gas ethane providing. However receipted domestic ethane has a high level impurity ethylene and special additions of sulfuric-bearing spirits (mercaptans) for import to gas of specific odour.

The present work was taken for creation of the setup obtaining of high purity ethane from available and inexpensive ethylene.

Choosing of method and setup operating conditions

The setup operating based on preferential adsorption of impurities in cleaning ethane. Heavy impurities of hydrocarbons, sulphite compounds,water and so on are adsorbed actively and reversibly on adsorbents similar to carbons, silicagels and their absorption are determined largely by dispersive attraction and is not specific (besides water).

Ethylene as a saturated hydrocarbon is classified by presence of π-bond in which the electron density localized on some bonds or atoms.Such molecules are capable to reveal specific intermolecular interactions along with universal unspecific one. That interaction reveals in particular on crystalline porous ceolit having positive charge localized on extended into periphery of small sizes cations.

In this work the ceolit CaA (5A) was used which possess by most capisity as regard C_2H_4 in mixture with C_2H_6 ($\sim$20 ml C_2H_4/1g ceolit).

The setup constructional features

The setup (Fig.1) has two pair of absorber ($V = 1,2$ L) ,which of them are connected in series with each other in their pair. The installation was made in such a way that operating of one pair adsorbers is performed simultaneusly with the regeneration another pair. First adsorber from each pair filled of 2/3 volume by selicagel KSK and of 1/3 volume by activated carbon SKT. Second adsorber filled by ceolit CaA (5A). Gas from vessel through cleaning line and vacuum taps 9-10-1-2-3-4-27-23 or 9-10-30-5-6-7-8-28-29 goes across adsorbers 1-2 or 3-4 and fills vessel where it is compressed by liquid nitrogen. The setup has line of vacuum processing, blowing and waste-gas disposal. The installation supplied by backing pump and manometric control system. The heating of adsorbers with the goal of regeneration is performed by thermostat based on heater cable KNMS available temperature up to 673 K at thiristor – convertor power 2 kWt. The gas analysis has been carried out at gas chromatograph "Tcvet-100".The chromatographic columns filled with stationary phase "Separon-VD" and SiO_2 were used.The sensitivity threshold of the device was $1 \cdot 10^{-2}$% vol on C_2H_6.The temperature of chromatographic colomns is varied from 293 K to 373 K.

Purity requirements

The main gas — ethane -99,9% vol.
Ethylene — no more than 0,05% vol.
Summary heavy impurities — no more than 0,05% vol.

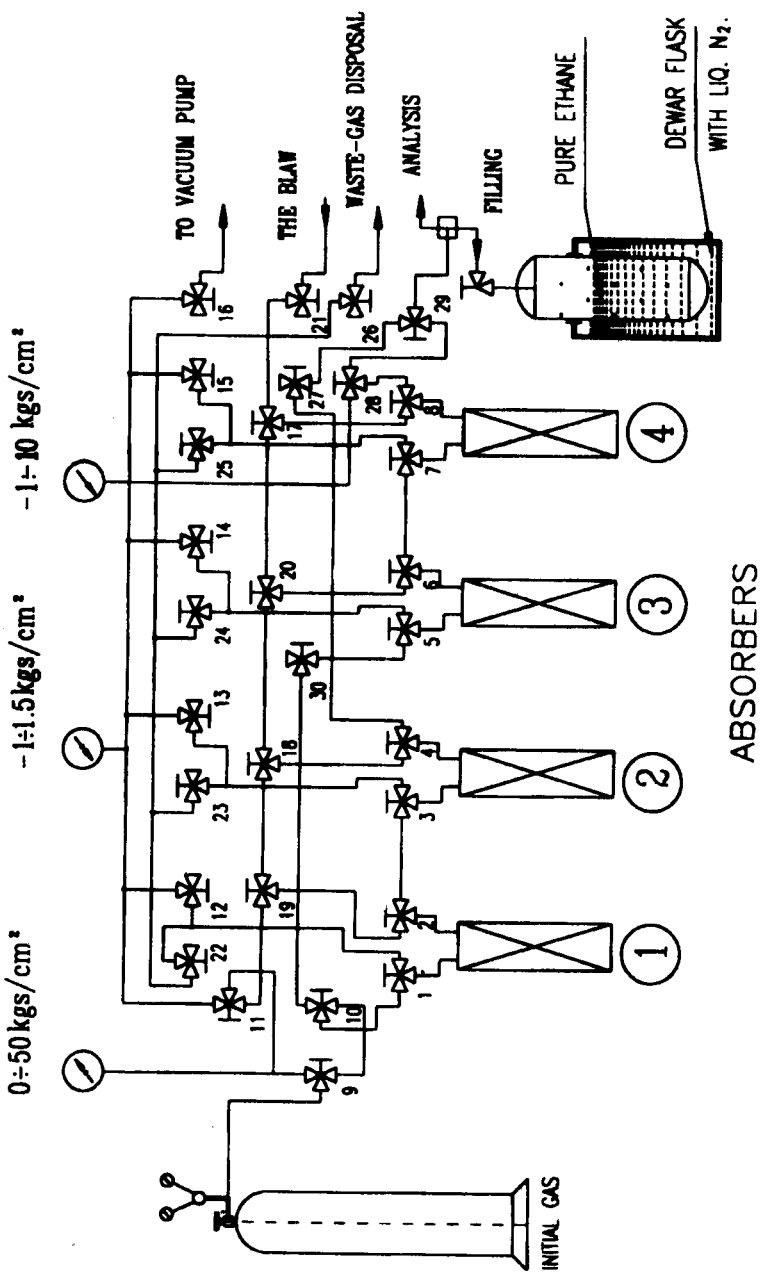

Fig.1. Scheme of the setup for high-purity ethane producing

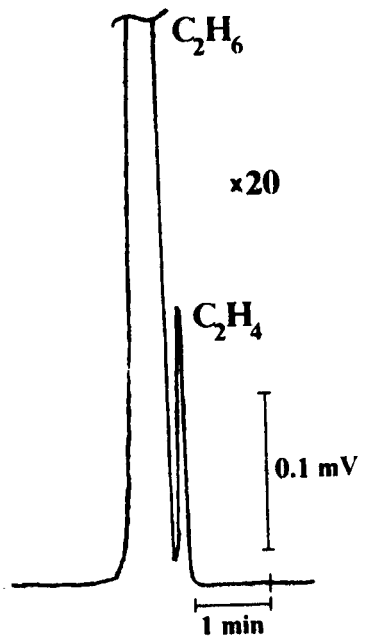

Fig.2. Chromatogram of technical ethane. Column with "Separon -VD". L = 100 cm, T = 293 K

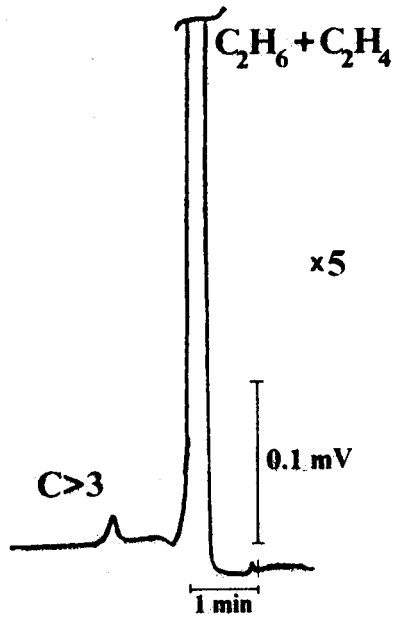

Fig.3. Chromatogram of technical ethane. Column,s temperature 393 K, L = 100 cm

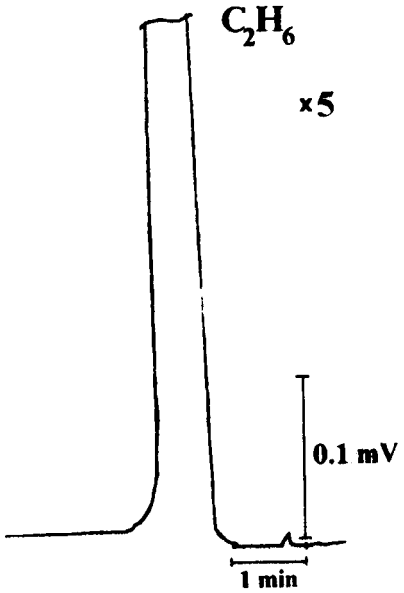

Fig.4. Chromatogram of pure ethane. Column with "Separon-VD". L = 100 cm, T = 293 K

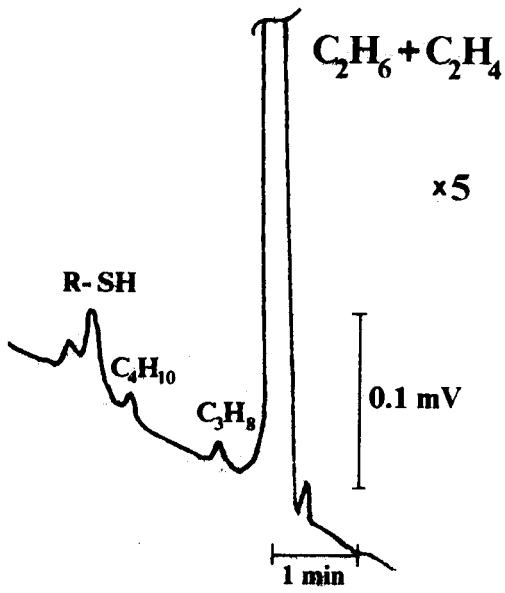

Fig.5. Chromatogram of contents in adsorber-1. Column with SiO_2. L = 200 cm, T = 393 K

The experimental results

It was found that initial gas (Fig.2) has the main impurity C_2H_4 (6% vol) and small amount of heavy hydrocarbons (0,1% vol) (Fig.3). The analysis results of pure gas are presented in Fig.4. The impurities of ethylene and heavy hydrocarbons at level $1 \cdot 10^{-2}$% vol were not found. By way of illustration the chromatogram of impurities concentrated in adsorber-1 is presented in Fig.5. From chromatogram it appears that heavy impurities including mercoptans has been absorbed in adsorber-1. At the same time only impurity ethane is concentrated in adsorber-2.

In conclusion it should be mentioned that goal set at the beginning has been achieved.The method was selected, the setup was fabricated and sampled that had permits to receive high-purity ethane for the drift chambers "PHENIX" and to supply the daily productivity of ethane 1 m^3.

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CRYOGENIC INTERNAL HYDROGEN GAS TARGET

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The internal gas targets are widely used at various storage rings of accelerators (atomic polarized hydrogen/deuterium gas target, HERMERS, DESY Hamburg and so on). The main aim of such type of targets (from technical point of view) is to create:

– the maximum possible density of the atomic or molecular gas on the way of the particles;

– to restrict the gas area as much as possible because the target vacuum is the same as storage ring vacuum (it is impossible to use any walls on the beam way).

For the electron storage ring at Novosibirsk Nuclear Physics institute the cryogenic hydrogen/deuterium gas target was designed and produced (see Fig.).

The target creates the cloud of the could hydrogen or deuterium gas with the average total density 10^{14} molecules/cm^2 (temperature 8 K – 30 K) on the electron beam way.

The storage gas cell has the 400 mm length along the beam direction and the 35 mm diameter. Gas cell is surrounded by the special gas volume for the heat exchange. The synchrotron radiation inside the cell introduces the heat power about 1.0 – 1.5 W. The heat goes through the heat exchanger volume to the liquid helium. The heat exchanger volume is filled by low pressure helium, and we can change the rate of the heat flow by varying the pressure (1 mbar – 10 mbar). For the precise temperature stabilization of the internal surface of the gas cell the electrical heaters are used. There are two temperature sensors TBO 1000K on the surface of the gas cell for temperature measurements. This structure