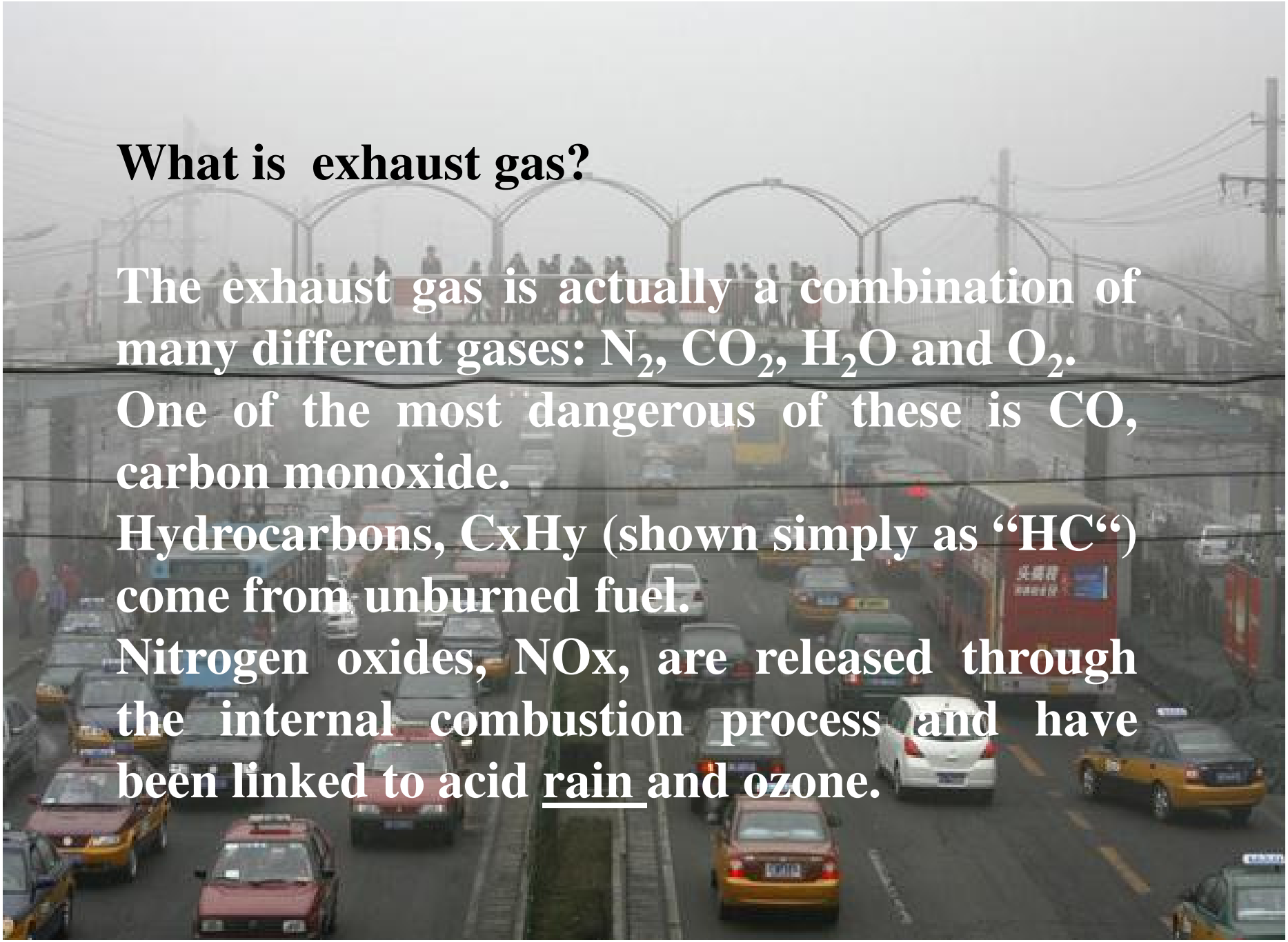
AZERBAIJAN NATIONAL ACADEMY OF SCIENCES
INSTITUTE OF PETROCHEMICAL PROCESSES
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Dearomatization of straight-run diesel fuel by using adsorbents under magnetic field

- Actually, many people are exposed to exhaust emissions every day in different ways: motor vehicles running on fuel and diesel, trains, ships, electric generators, factories and plants. In fact, the bulk of air pollution in cities comes from car exhaust.





What is exhaust gas?

The exhaust gas is actually a combination of many different gases: N_2, CO_2, H_2O and O_2.
One of the most dangerous of these is CO, carbon monoxide.
Hydrocarbons, CxHy (shown simply as "HC") come from unburned fuel.
Nitrogen oxides, NOx, are released through the internal combustion process and have been linked to acid rain and ozone.

We inhale airborne particles that enter our respiratory system and fasten in our lungs. This can affect human health in both the short and the long term. The consequences for our health are alarming:

- **Short term: acute respiratory problems, reduced lung function, chronic bronchitis, asthma, etc.**

- **Long term: cardiovascular problems, lung cancer, bladder cancer, etc**.



Ecological rating of diesel fuel quality

Parameters	Euro-2	Euro-3	Euro-4	Euro-5
Mass concentration of sulphur,% (ppm), no more	0.300 (3000)	0.050 (500)	0.035 (350)	0.005 (50)
Cetane number, no less	45	49	51	51
Density at 15ºC, kq/m^3	820-860	820-860	820-845	820-845
Kinematic viscosity at 40ºC, mm^2/s	2.0-4.5	2.0-4.5	2.0-4.0	2.0-4.0
Content of polycyclic aromatic hydrocarbons, % no more	No norm.	No norm.	11	3

Emission standards for automobiles q/km

Stage	Date	CO	HC	HC + NOx	NOx	PM
Diesel						
Euro 1	1992.07	2.72 (3.16)	-	0.97 (1.13)	-	0.14 (0.18)
Euro 2, IDI	1996.01	1.0	-	0.7	-	0.08
Euro 2, DI	1996.01	1.0	-	0.9	-	0.10
Euro 3	2000.01	0.64	-	0.56	0.50	0.05
Euro 4	2004.01	0.50	-	0.30	0.25	0.025
Euro 5a	2009.09	0.50	-	0.23	0.18	0.005
Euro 5b	2011.09	0.50	-	0.23	0.18	0.005
Euro 6	2014.09	0.50	-	0.17	0.08	0.005

Toughening of environmental requirements about permissible content not only sulphur but also aromatic hydrocarbons in modern diesel fules, especially polycyclic aromatic hydrocarbons specified with series of reasons:

- - during decreasing of polycycloarens in diesel fuel decrease carcinogenic risk of exhaust gases;
- - increasing of aromatic hydrocarbons during fuel burning leads to intensified formation of carbon monoxide and soot;
- - high content of aromatic hydrocarbons in diesel fuel leads to raised concentration of nitric oxide in exhaust gas;
- - increasing of aromatic hydrocarbons content leads to sharp decreasing of certan number of diesel fuels and as reason to difficulty on engine start, engine details wear and increasing of NO_{χ} and CO_2 in exhaust gases.

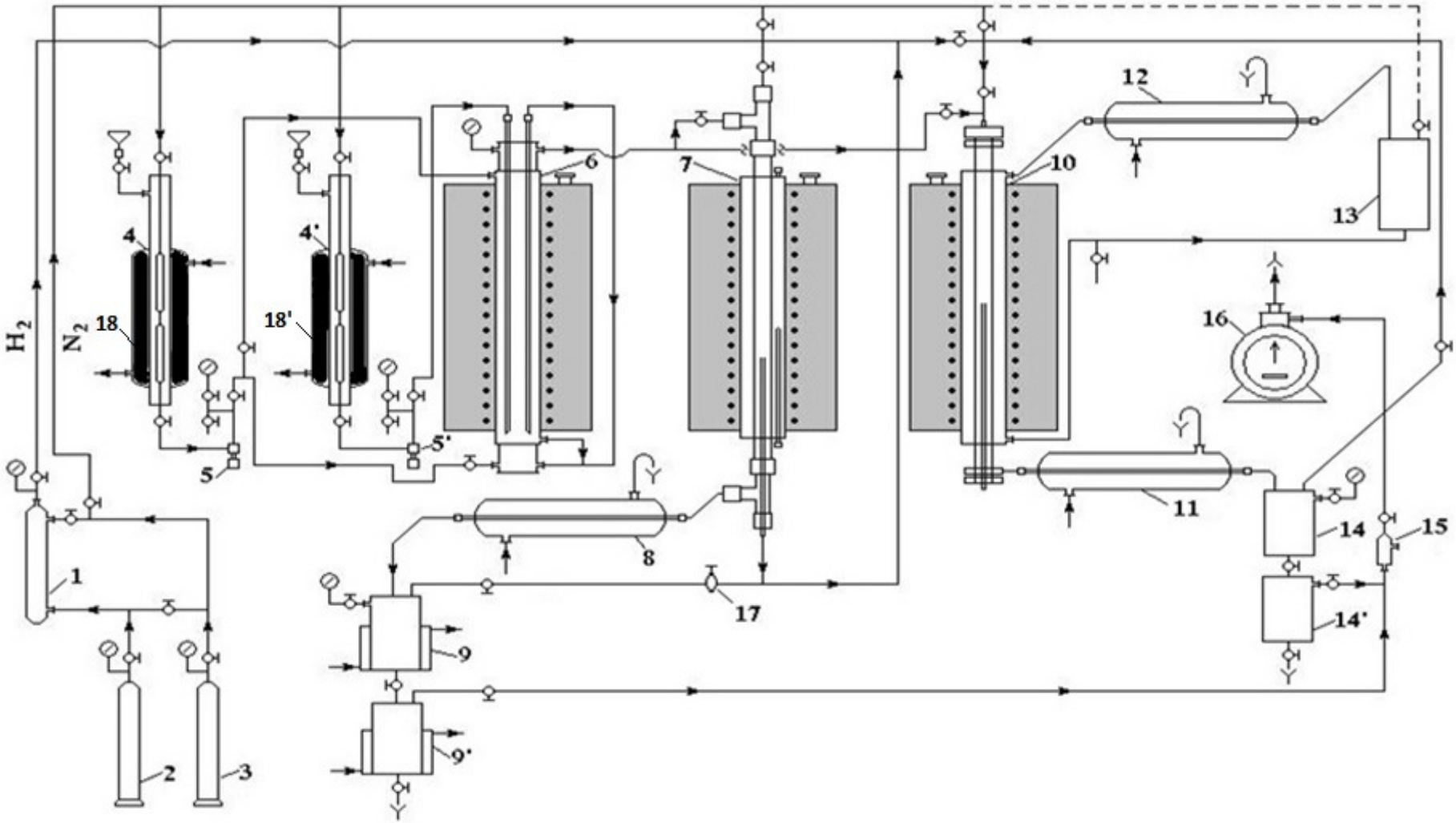
- Traditional cleaning methods of diesel fuels from aromatic hydrocarbons are not economically sound because realized on high temperatures and with using of expensive catalysts and hydrogen. At present the alternative cleaning processes are adsorbtion and extraction dearomatization of diesel fractions.

- Aromatic hydrocarbons can adsorb on special selected adsorbents better than paraffin and naphthenic hydrocarbons. Releasing aromatic hydrocarbons from oil products based on the above.

- At last years intensified the interest to low energy influence with which assistance it is possible to reconstruct the material structure without appreciable external expenditure of energy or with using of inside reserve of matter. As external action effected to material structure including oil disperse systems there can be used various variations of electric, electromagnetic, magnetic, vibration and acoustic fields.

- At this research work there were investigated adsorbtion dearomatization of diesel fractions under the influence of magnetic field. As adsorbent researched zeolite comprising adsorbent of local minefield “Imishli” (I) and cation-exchange resin KU-2 (II).

Process flowsheet of laboratory setup for adsorbtion dearomatization under magnetic field influence

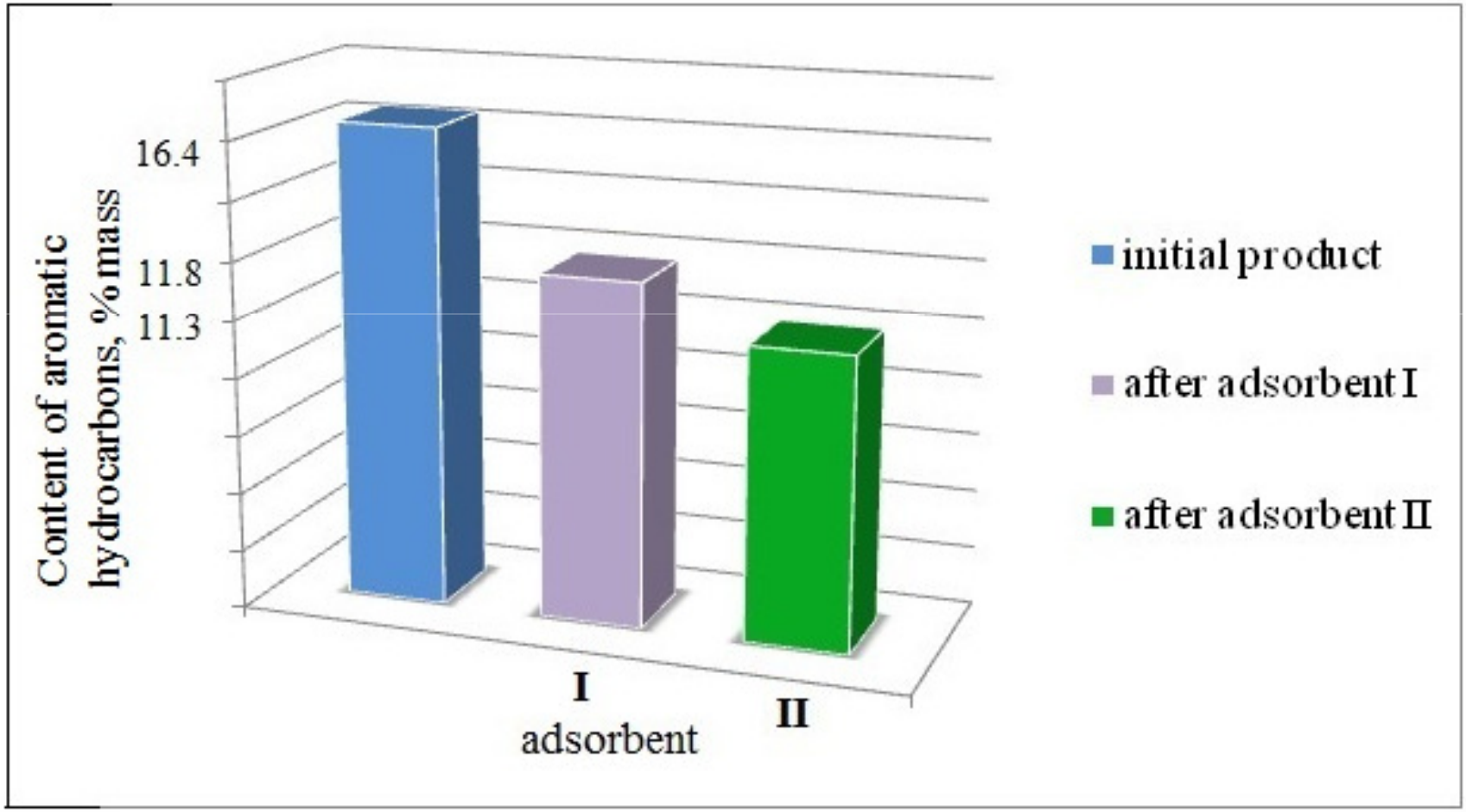


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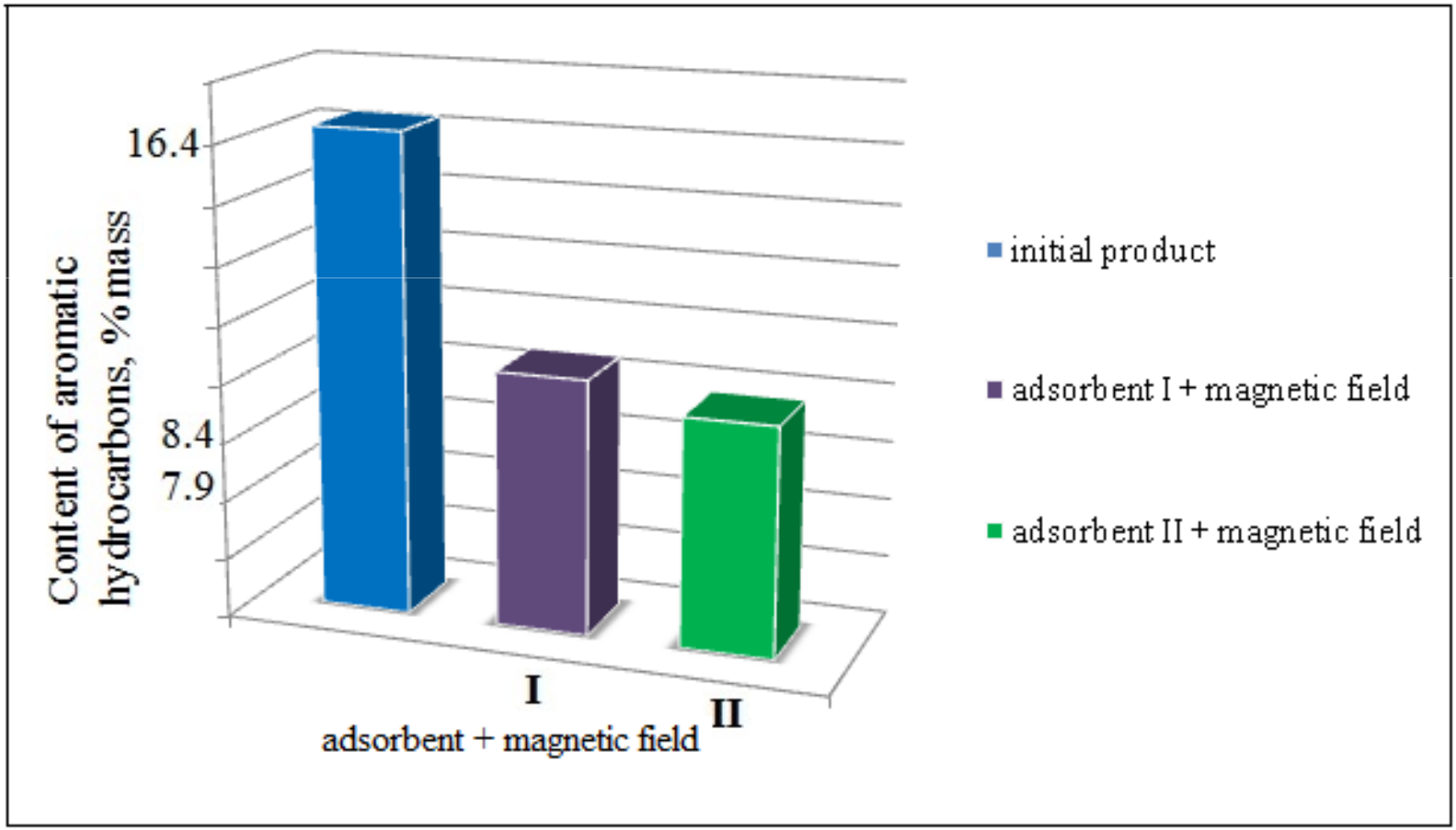
- 1-gas collector; 2, 3 – gas bottles; 4, 4′ - raw measuring tank; 5, 5′ - dosing pumps, 6 – mixer heater; 7, 10 – reactor of middle and high pressure; 8, 11, 12 – coolers; 9, 9′ - separator-coolers, reactor of middle pressure; 13 - drop catcher; 14, 14′ - separators, 15 - controlling pressure valve; 16 – gasometer; 17 - throttle valve, 18, 18´ – magnet activators.

- Investigation showed that using of magnetic field intensifies adsorbtion effect of aromatic hydrocarbons. So, if content of aromatic hydrocarbons with using adsorbent (I) decreased to 28% and composed 11,8% mass, using of magnetic field leads to decreasing of aromatic content more on 24% and total content of aromatic hydrocarbons at this consists 7,9% mass. Using of adsorbent (II) under magnetic field decreased content of aromatic hydrocarbons to 49% mass.

Dependence of aromatic hydrocarbons content according to the type of adsorbent



Dependence of aromatic hydrocarbons content according to the type of adsorbent and magnetic field influence




Thank you
for your
attention