DEVELOPMENT OF ANTI-DETONATION ADDITIVE

Rakhimov Ganisher Baxtiyorovich
Associate professor, Karshi Institute of Engineering and Economics,
Republic of Uzbekistan, Kashkadarya region

Abstract: this article presents the results of research on the development of anti-knock devices based on synergistic mixtures of oxygen compounds and SFMs, and on the determination of the phase stability of the gasoline-alcohol-water system.

Key words: gasoline, alcohol, water, chloroform, benzene, ethyl alcohol, BK, ETBE, isopranol, AI-80.

The increase in the number of passenger cars in the world is the reason for the increase in the demand for motor fuels. With the increase in the number of cars, the amount of toxic gases emitted by them increases, which is one of the main factors that aggravate the environmental situation, and therefore the environmental requirements for automobile gasoline are becoming more serious. There are many directions in the production of automobile gasoline that meet these requirements, among them The development of anti-detonation devices for gasoline is of great importance today.

In the world, scientific research work on the production of gasoline-alcohol compositions in order to increase the anti-detonation raw material resource of automobile gasoline is being carried out at a rapid pace. The main complexity of the compositions obtained from various liquid phase dispersion systems based on various alcohols and automobile gasolines is the main complexity, and special attention is paid to the development of technologies aimed at obtaining compositions with properties such as phase stability of these gasoline-alcohol-water systems, clouding temperature and long-term non-precipitation.

The results of the induction period of gasoline and its components obtained on the basis of an oxygenated compound, the amount of tars, the size of the dispersed phase particles in the gasoline + oxygenate dispersion system, the

surface tension and adhesion between the surfaces of the gasoline-alcohol-water system, and the lubricity properties of gasoline and gasoline + oxygenate fuel mixtures are presented. .

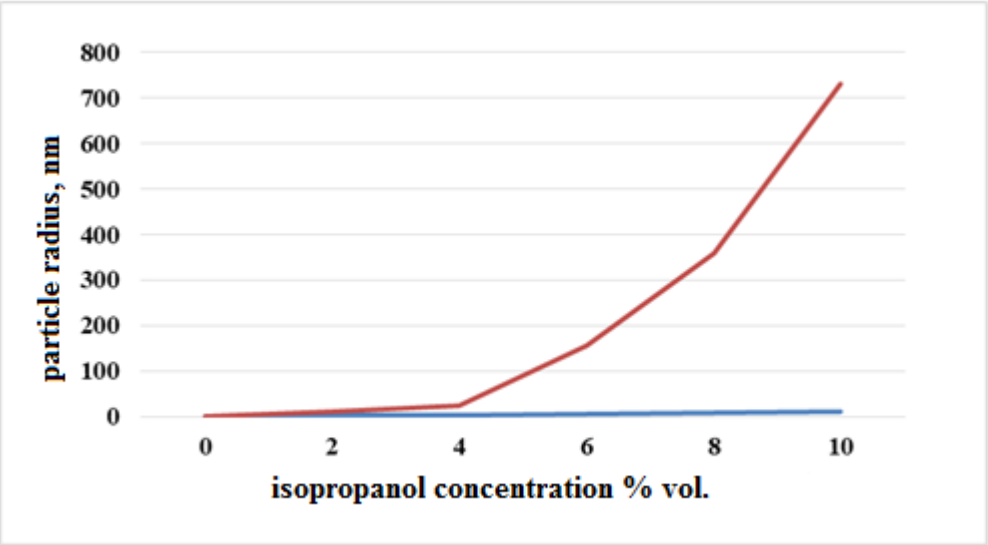
In order to confirm the results of our research, we determined the induction time of domestic automobile gasolines AI-80 and AI-91 as brand gasoline and gasoline compositions containing oxygenates. The results are presented in table 1. As can be seen from the table, the induction period of AI-80 motor gasoline increased from 27 to 36 days when BK-IP-ETBE-3 was added, and the induction period of AI-91 motor gasoline increased from 32 to 35 days when BK-IP-ETBE-4 was added.

1 – table

Induction cycles of domestic AI-80, AI-91 gasolines and gasolines with oxygenate components added to them

Gasoline type	Induction period
AI-80	27
AI-91	32
AI-80 gasoline + 5% БК	34
АИ-80 gasoline + 5% ЭТБЭ	33
АИ-80 gasoline + 5% ИП	31
АИ-80 gasoline + 2% БК-ИП-ЭТБЭ-3	36
АИ-91 gasoline + 1% БК-ИП-ЭТБЭ-4	35
АИ-80 gasoline + 5% МТБЭ	34
АИ-80 gasoline + 5% ЭС	31

At the next stage of our research, with increasing the amount of IP alcohol in AI-80 gasoline, the change in the size of the phases was studied. The results of the size analysis are presented in Figure 1.



1 - picture. Particle size when adding 5% IP to AI-80 gasoline

The obtained results showed that the particle size increases with the increase of alcohol concentration in gasoline+alcohol composition. When adding 5% IP to AI-80 gasoline, the particle size was 110 nm. In order to analyze the obtained indicators, the radius of the volume quantitative function of alcohol was approximated. The dimensions increased faster than predicted by the phase constant number. This means that there is coalescence in the mixture, which subsequently leads to a loss of system strength.

Table 2

Values of interfacial surface tension between some liquids and water

Liquid	$t, ^{\circ}C$	Between liquid and air, σ		Organic liquid – water for the limit, σ	
		Water for floor	For organic liquid	Calculated value	Experimental value
Chloroform	18	59,8	26,4	33,4	33,8
Aniline	26	46,4	42,2	4,2	4,8
Benzene	19	63,2	28,8	34,4	34,4
Ethyl alcohol	18	26,3	21,5	4,8	4,8
BK	25	34,5	30,4	4,1	4,1
DO NOT	25	27,8	21,3	6,5	6,9
Isopranol AI-80	25	28,4	23.2	5,2	5,2

gasoline	20	62,4	27,5	34,9	34,9

In studies with ethers and alcohols, the smallest dispersed phase particle sizes that could be detected by the instrument were 1,4 nm for ETBE and 1,7 nm for BK. When the three-dimensional modeling of the dispersed particles was carried out, it was found that such a dimension corresponds to the tetrahedral model where the molecule is located inside the dispersed particle.

In our research, we experimentally determined the values of the interfacial surface tension between some liquids and water. Table 2 shows that as the difference between the polarity levels of two liquids decreases, their mutual solubility increases, and the difference between $\sigma_{c_1-газ}$ and $\sigma_{c_2-газ}$ decreases. For liquids with infinite mutual solubility, this difference tends to zero.

High-octane additives and fillers for automobile gasolines and their mechanisms of action, introduction of oxygenated compounds in gasoline, their contribution to complete combustion, lubricity properties of automobile gasoline and gasoline+oxygenate fuel mixtures were studied. Lubricity of automobile gasolines AI-80 and AI-91 when it was determined, the diameter of AI-80 gasoline was 580 mkm, and that of AI-91 gasoline was 590 mkm. It was found that this indicator decreased to 412 mkm in the gasoline sample to which the composition of AI-80 and oxygenates was added.

Based on the obtained results, the following conclusions can be drawn:

- The principle of operation of modern gasoline engines working on automobile gasoline and the requirements for the operational properties of automobile gasoline used in them were studied and analyzed.

- It was shown that the particle size increases with the increase of alcohol concentration in gasoline+alcohol composition. When adding 5% IP to AI-80 gasoline, the particle size was 110 nm. It was found that increasing the concentration of alcohol in gasoline+alcohol composition shows an increase in phase stability in this system.

- Lubricity properties of automobile gasoline and gasoline+oxygenate fuel mixtures were studied. When determining the lubricity of AI-80 and AI-91 gasolines, the viscosity of AI-80 gasoline was 580 μm, and that of AI-91 gasoline was 590 mkm. It was found that this indicator decreased to 412 mkm in the gasoline sample to which the composition of AI-80 and oxygenates was added.

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