THE INFLUENCE OF THE PARAFFIN CONTENT ON THE EFFECT EXERTED BY THE WEIGHTING COMPONENT ON THE EFFECT OF THE DEPRESSANT ADDITIVE

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Diesel fuel is the main type of fuel used in the northern and arctic regions of the Russian Federation. The main problem with the use of diesel fuel is the lack of fuel that meets the requirements of [1]. In [2], it was established that the addition of n-paraffins in low concentrations to the diesel fuels increases the efficiency of the depressant additive, which is added to the fuel to improve its low-temperature properties.

The purpose of this work is to study the effect of paraffin content on the effect exerted by the weighting component on the effect of the depressant additive.

Fuel mixtures were used as objects of research. The composition of mixtures is: straight-run diesel fuel, depressant additive and weighting components (paraffin fraction (PF), vacuum gasoil (VG) and heavy fraction (HH)). The concentration of the used depressant additive was 0.26 ml per 100 ml of diesel fuel (according to the manufacturer's recommendations), the concentration of weighting components is 5 % vol.

To obtain the effect of weighting components on the effectiveness of the depressant additive, low-temperature properties (the cold filter plugging point (CFPP) and pour point (PP)) of fuel mixtures, the molecular weight of weighting components and the content of paraffins in the paraffin fraction was determined.

Table shows the results of determining the molecular weight of the weighting components.

As can be seen, the PF sample has the lowest molecular weight, the content of paraffins in which is 3 % wt. Sample VG has the highest molecular weight.

Figure shows the results of determining the low-temperature properties of the studied fuel mixtures.

According to the data obtained, it can be concluded that the addition of the lightest weighting component (PF) in terms of molecular weight has a significant positive effect on the CFPP (it decreases by 6 °C), which makes it possible to obtain summer grade fuel from substandard fuel. However, the addition of PF negatively affects the change in the value of PP (it increases by 6 °C). The addition of the heaviest weighting component (WG) in terms of molecular weight, we can see the improvement in the PP index (by 4 °C) and deterioration in the

Table 1. Results of molecular weight determination

Molecular weight, g/mol		
PF	HH	VG
181,186	272,971	325,567

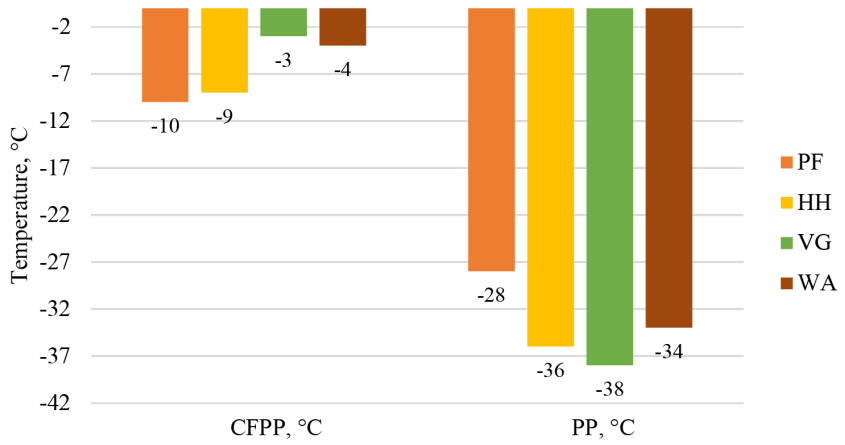

Fig. 1. *Low-temperature properties of fuel mixtures: WA – diesel fuel with a depressor without adding a weighting component*

CFPP (by 1 °C). The addition of a heavy fraction (HH) brings an improvement in the CFPP and PP by 5 and 2 °C, respectively, as a result of which the DF brand becomes summer.

Thus, to increase the effectiveness of the depressant additive regard to CFPP, it is desirable to use a weighting component – a paraffin fraction at a concentration of 5 % vol. with a total paraffin content of 3 % by weight.

References

1. *GOST 305-2013. Diesel fuel. Technical specifications. – Moscow: Standartinform, 2014. – 12 p.*
2. *Orlova A. M., Bogdanov I. A., Kirgina M. V. The effect of adding solid paraffins of normal structure to diesel fuel on the effectiveness of depressant additives //Oil refining and petrochemistry. Scientific and technical achievements and best practices, 2021. – № 6. – P. 11–16.*

CYTOTOXIC COMPLEXES OF ESSENTIAL METALS WITH 4-CHLOROPHENYLTETRAZOLE AND OLIGOPYRIDINES

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Coordination chemistry of the compounds with pronounced biological properties is promising due to the successful use of cisplatin cis-$[Pt(NH_3)_2Cl_2]$ as anticancer drug in medicine. Essential metal complexes are expected to have fewer side effects. An important factor for further research is the biological activity of the ligands themselves, since the biological properties depend on the nature of the metals, and also on the ligands' nature and the functional groups involved in coordination. Tetrazole derivatives are of considerable interest as candidate drugs with anticancer, antiviral, and antibacterial properties, therefore the use of these compounds as ligands is promising.

As part of our work, mixed-ligand manganese (II) and zinc (II) complexes with 4-chlorophenyltetrazole (HL) and oligopyridine ligands (1,10-phenanthroline (phen), 1,10-phenanthroline-5,6-dione (phendione), 4,7-dimethyl-1,10-phenanthroline (dmphen), 2,2'-bipyridine (bipy), 4,4'-dimethyl-2,2'- bipyridine (dmbipy)) were synthesized. All compounds were obtained from aqueous ethanol solutions with a molar ratio of reagents M^{2+} : HL:oligopyridine = 1 : 2 : 1 or 1 : 2 : 2. The complexes were characterized by elemental, thermogravimetric and powder X-ray diffraction analyzes, IR spectroscopy.

Crystal structures were established for some complexes by single-crystal X-ray diffraction analysis. The crystal structure was determined for zinc (II) complex $[Zn_2(dmbipy)_2L_4]$. It was shown that the complex is binuclear, and the zinc cation has a tetragonal-pyramidal environment (Fig. 1). All obtained mixed-ligand manganese (II) complexes are mononuclear. Oligopyridine molecule and L^- are coordinated to the central manganese atom, three water molecules complete the coordination sphere to an octahedral one (Fig. 1). Another 4-chlorophenyltetrazole ligand is located in the outer sphere and serves as a counterion.

The cytotoxic properties of the obtained complexes were studied on hepatocellular carcinoma cells (HepG-2). Most of the manganese (II) and zinc (II) complexes did not cause cell death in the concentration range of 1–50 μM (IC_{50} > 50 μM), except for manganese complexes containing highly cytotoxic ligands such as phendione and dmphen. Nevertheless, a cytostatic effect was observed for the obtained compounds: cell growth and division were inhibited under the action of the complexes.

In addition, antimicrobial activity was investigated. Antibacterial activity was determined against gram-positive and gram-negative bacteria (*S. aureus* and *E. coli*) by the agar diffusion method using furazolidone as a reference drug. The fungistatic action of the compounds against the fungus *P. italicum* was also studied by the agar diffusion method (the reference drug was fundazol). The protistocidal action of the compounds was studied in relation to the protozoa *C. steinii* (comparison drugs – toltrazuril