Let us consider arising local deficiencies on the market of certain regions. They are provoked by non-uniform capacities of oil processing on the territory of Russia. There are different data about oil processing: the main weakness is the place of Russian oil processing factories: the capacities of catalytic cracking and hydrocracking are not enough; raw materials are fuel oil, but the main production is connected with a high-quality motor fuel.

Omsk Refinery can be use as an example. The first settings were put into exploitation in the middle of the 1950-ies, and now it is not exploited. In 2001 a new alkylation setting for production of motor gasoline has been put into operation. Despite all complexity of the situation around Russian oil processing, scientific research and project work have considerable resources that allow avoiding a serious fuel crisis in the country. Thus, oil policy of the state has become one of the main reasons for a pre-crisis situation in the Russian oil processing to arise.

Concentrating on the problem of the European quality standards of fuel, it should be noted that this idea is actively supported by the “Lukoil” company. “Lukoil” is considerably ahead in modernization of the plants in Russia, in comparison with the other Russian companies, and its transfer to the new standards gives it certain competitive advantages [2].

“Lukoil” studies the possibility of oil refineries construction in Tver region. The weakness of state regulation and the lack of accurate reference points are the main reasons why the oil companies plan and carry out the actions for oil processing development guided by their own interests [3]. Reconstruction of the operating plants with application of modern technologies of oil refining catalytic and hydrocracking, hydro-treating and others automatically allows to produce “Euro four”-class products.

Many interests of the companies are in contradiction with each other. Consequently, it causes the known discrepancy of the recommended measures. Someone suggests to lower the rates of export duties on oil products in order to develop oil processing and export high-quality products, but not crude oil. Some say, on the contrary, that it is necessary to raise them to the level of a domestic market.

It is possible to allocate a number of measures [4]:

1. Reduction of rates for oil products;
2. Strengthening of the state control above the integrated oil companies and petro-trades;
3. Cancellation of duties on import of the equipment for oil processing industry;
4. Creating the exchange of petroleum and oil products.

Today the hopes for developing a competitive market of oil and oil products in Russia seem to be almost impossible. So, to solve of these serious problems it is necessary to build modern plants and create new, well-equipped companies.

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FTIR-SPECTROSCOPY FOR INVESTIGATING PIPELINE COATING COMPOSITION AND PROPERTIES

T.A. Gerasina

Scientific advisors associate professor A.G. Zarubin, associate professor G.P. Pozdeeva

National Research Tomsk Polytechnic University, Russia, Tomsk

Transporting oil, gas, and petroleum products for great distances *through pipelines* is the most effective method of *transportation*. Corrosion protection is the key factor to ensure pipeline durability and accident-free operation. Anticorrosion coatings have to provide a primary protection preventing the interaction of corrosion agents, such as water and aerial oxygen, with the metal [2]. To efficiently perform its function, the anticorrosion coating quality should meet the general requirements for corrosion protection [3]. Therefore, it is necessary to investigate the chemical and mechanical properties of insulating coatings, including resistance to the corrosive and physical impacts caused by external environmental factors. FTIR spectroscopy identifies the functional groups and determines the degree of mechanical and chemical degradation on the fractured surface of polyethylene [1].

The aim of this work is to study the composition and mechanical and chemical properties of anticorrosion coatings for oil and gas pipelines via FTIR - spectroscopy. This aim determines the following objectives:

– to analyze the samples of oil and gas pipeline anticorrosion coating via FTIR spectroscopy;
– to identify functional groups in the IR-spectra of the test samples;
– to determine the composition and mechanical and chemical properties of anticorrosion coating on the basis of the data from supporting documents and FTIR spectrum analyses.

Two samples of each of four anticorrosion coating types were investigated via FTIR-spectrometer. The first type of anticorrosion coating was anticorrosive polymeric-asmol coating tape “LIAM-3” meeting the requirements of GOST R 52602-2006. [3] The second type was primer asmol coating made in accordance with the requirements of GOST 51164-98 and GOST 9.602-2005 [4, 5]. The third type of samples was heat shrink insulation joint THERMO – STMP meeting the requirements of GOST 51164-98 and GOST 9.602-2005 [4, 5]. The fourth type was heat shrink double-layer radiation-modified anticorrosion material DONRAD-R [3]. Samples for IR-spectrometer were thin slices of anticorrosion coatings used for oil and gas pipelines. All FTIR spectra were acquired in transmission mode on the "Nicolet IS10", which allowed determining the functional group composition of the coatings [1, 6].

Structure and properties classification of anticorrosion coatings for oil and gas pipelines was made on the basis of IR spectra of the samples. The results are summarized in table 1. We identified seven significant peaks at wavenumbers: 960-660, 716, 1170, 1375, 1746, 2927-1010, 3200, 3450 cm^{-1}. These peaks are characterized by the presence of the heterocyclic compounds such as thiophenes, pyridines, quinolones and functional group $-CH_2-$ at a wavenumber of 716 cm^{-1} and 1471, 2850, 2927 cm^{-1}, respectively. At the wavenumber 1746 cm^{-1}, the presence of carbonyl group in a minor amount was revealed. The wavenumber of 1170 cm-1 is characterized by the presence of aromatic compounds, which causes the decrease in the rate of radiative transitions in polyethylene. The spectral range 960-660 cm^{-1} is characterized by the presence of acyclic unsaturated hydrocarbons (alkenes) which are parent material for the preparation of polymers. The stretching vibrations of C=C in alkanes occur at the wavenumber of 1740 cm^{-1} (structure fragment oscillations - $F_2C = C$). The wavenumber of 1375 cm^{-1} and spectral range 2927-1010 cm^{-1} are characterized by the presence of functional groups, CH3- and -CH2, respectively. Furthermore, the presence of ketones indicates the process of thermal-oxidative breakdown (thermal ageing) at the wavenumbers of 3200 and 3450 cm^{-1}.

Table

Organic compounds of the investigated anticorrosion coatings

Object / Wavenumber, cm^{-1}	Anticorrosive polymeric-asmol coating-tape “LIAM-3”	Primer asmol coating	heat shrink insulation joint THERMO - STMP	heat shrink double-layer radiation-modified anticorrosion material DONRAD-R
960-660	Alkenes			
716	Quinoline			
1170			Aromatic hydrocarbons (to reduce the rate of radiative transitions in polymers)	
1375			$-CH_3-$	
1746	Carbonyl group			
2927-1010	$-CH_{2-}$			
3200 , 3450			Ketones (the process of thermal-oxidative breakdown (thermal ageing))	

FTIR-spectroscopy was used to analyze anticorrosion coatings of four different types. The investigation on mechanical and chemical properties of anticorrosion coating and the results obtained have shown that the intensity of carbonyl groups depends on the depth of the crack indicating the degree of degradation. The highest rate of the carbonyl group presence is characteristic for the crack at the place of origin and located in the immediate vicinity to the inner surface of the pipe.

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