

REVIEW

From foreign scientific advisor to the Ph.D. thesis of Bekbassov Timur Muratovich "Developing polymer additives for regulating oil rheological properties " submitted for the Ph.D. degree in the specialty 6D072100 – Chemical technology of organic substances

Dissertation work is devoted to the development of new highly effective depressant additives based on ethylene-vinyl acetate copolymers by electron-beam grafting of hydrophobic monomers for preparation of oils for transportation and determination of optimal technological conditions of their application on oil from the Kumkol group of fields.

In the Republic of Kazakhstan, oil production is constantly increasing and new oil fields are being explored. Continuous exploitation and flooding of reservoirs has led to the fact that today the water cut of the reservoirs exceeds 60%, which leads to such complications as deposits of inorganic salts on the inner surfaces of equipment and pipelines, corrosion, as well as intensive emulsion formation. On the other hand, increasing the share of heavy oils in the transported blends leads to problems of pumping through the main pipelines in the cold season due to the high pour point and deterioration of rheological properties with decreasing temperature.

Historically commercial EVA-based PPDs have shown good depression properties on oil from the Kumkol oilfield of Central Kazakhstan. However, due to the presence of polar groups in EVA that increase the likelihood of migration into the aqueous phase, these PPDs have limitations in use because of reduced co-crystallization of PPDs with wax in oils with high water content. Hydrophobic groups are thought to tend to eliminate the problem of solubilization of depressants in water.

To do this, Timur used the method of hydrophobization of commercial EVA by radiation grafting of monomers onto EVA macromolecules due to its high efficiency, simple process with low cost, and lack of chemicals other than reagents, so the products can be processed immediately after irradiation without polymer purification.

According to the results of tests of the developed EVA-based graft copolymers (gEVAp) as depressant additives, the maximum effect is achieved at concentrations significantly lower than the commercial EVA-based pour-point depressants currently used. The rheological parameters of oil have been dramatically improved, which can be characterized as better oil pumpability in the cold season, which reduces the load on mainline pumps and saves energy for the transporting company. The pour point of the tested oil dropped from 12 to -3 ° C, which led to the formation of wax crystals of the regular, compact platelet shape. The results obtained are of high importance in terms of practical application.

It is noteworthy that the work contains not only the results of laboratory tests, but also the plans for the field tests. Field tests using pigs should show significantly less wax deposited along the pipeline, as one of the KPI. The results of field tests will be used to compile guidelines for the application of polymer depressor additives under field conditions.

The thesis is well organized and easy to understand. The literature review section contains relative information to show the advantages and disadvantages of existing reagents used to reduce the pour point of crude oil.

The results of the work have been presented in 10 publications: 3 publications in journals included in the Scopus database, 2 publications approved by the Committee for Quality Assurance in the Sphere of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan and 3 abstracts of reports at international and national symposiums and conferences, 4 innovative patents of the Republic of Kazakhstan were filed.

In accordance with the foregoing, I believe that the dissertation work of Timur Bekbassov meets the requirements for PhD thesis in terms of volume of research performed, its scientific and practical importance and can be recommended for defense in the specialty 6D072100 – Chemical technology of organic substances.

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