



TEXAS TECH UNIVERSITY

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Review

From foreign scientific advisor

to the PhD thesis of Alexey Shakhvorostov on the topic: “Hydrophobically-modified polymer additives for inhibition of paraffin sediments and reduction of pour point of crude oil” submitted for the requirement of a PhD degree in the specialty of 6D073900 – Petroleum Chemistry.

Mr. Alexey Shakhvorostov, a PhD student, has been working with Kazakhstan’s oils since 2012. I met him in 2013 in Almaty and agreed to be his foreign advisor in the USA in 2016. Since that time, I have been keeping eye on his research. In fact, in 2015 Alexey Sh. spent two weeks working with my team in Texas Tech University (USA).

The PhD thesis of Alexey Sh. was dedicated to the synthesis of multifunctional hydrophobically modified polymers which can be applied for the reduction of pour point temperature of crude oil. This is an urgent task for the global oil industry. The author has conducted a complex scientific study at the level of modern science. In his research, Alexey used modern equipment and reliable methods of experimental analysis.

The thesis is well organized and clear. The literature review section contains relative information that was organized in a systematic way in order to show advantages and drawbacks of the existing reagents used for the reduction of crude oil pour point.

The author studied the effect of the synthesized reagents on the viscosity and pour point of crude oil. It has been shown that 200 – 1000 ppm of synthesized polymeric depressant can effectively reduce the viscosity and pour point of crude oil, moreover asphaltene-resin-paraffin-deposits reduction degree reached up to 80-99%. These results suggest that the reagents which were synthesized and studied in this work can be used not only for oil transportation but also for enhanced oil recovery purposes, where also published some papers. The author has used optical microscopy in order to study the paraffins crystallization process in crude oils and determine the critical temperature parameters that affect the fluidity of the oil.

I consider this work as novel since the author has:

1-Synthesized hydrophobically modified monomers and polymers with long carbon “tails” (C₁₂-C₁₈) and hydrophilic zwitterionic “heads”.

2-Thermal, hydrodynamic and conformational characteristics of polymers were studied thoroughly.

3-Physicochemical and rheological properties of Mangyshlak and mixed Buzachi-Mangyshlak oils were studied. Pour point temperature, composition, distribution of paraffins and acid number of crude oils were determined as well.

4-The author conducted laboratory tests on model pipeline and found the relationship between pour point depressant concentration and amount of asphaltene-resin-paraffin-deposits on the inner surface of the pipe.

The obtained results are of high importance in terms of practical application. It is remarkable that the work contains not only the results of laboratory tests but also the results of field pilot tests. The results of the pilot test were used in order to make guiding instruction on the application of polymeric pour point depressants in field conditions.

In the course of his PhD program, Alexey has participated in a number of scientific conferences. Together with his colleagues he has published 4 papers in peer reviewed journals. The papers were dedicated to the topic of his PhD thesis. This proves the high level of his work.

This PhD thesis meets all the requirements and I highly recommend him to defend his PhD research works. In my opinion he deserves to be Doctor of Philosophy (PhD) in the specialty of 6D073900 – Petroleum Chemistry.

Scientific advisor.

Sincerely,



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