Habilitation Thesis Review

Application of green nanocomposites in enhanced oil recovery

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Thematic focus
The thesis deals with nanomaterials and their applications in lowering the interfacial tension of hydrophobic and hydrophilic compounds in the formation fluids and thus contributing to enhanced oil recovery.

Thesis characteristics
The thesis has 74 pages of text, tables, figures and references, plus 10 Appendixes – reprints of published papers in peer-reviewed journals, where Mr. Jagar Ali is the principal author or co-author. The thesis has 237 pages in total. It is written in good English, it is well structured and has high level graphics. The overall impression is very good.

Methods
The author used a variety of methods to examine the nanocomposite materials, their properties and dynamics of the processes, such as XRD, FTIR and UV-VIS spectroscopy, TEM and SEM. The author proved ability to interpret these methods and make useful conclusions.

Evaluation
Enhanced oil recovery (EOR) plays a key role in oil&gas economic efficiency. Biodegraded and high-asphaltic oils have a low production rate and most of the oil remains in the subsurface. It is therefore very valuable, that the author dedicated an extended effort to develop new green nanocomposites and tested the efficiency of the laboratory EOR. 19 green nanocomposite mixtures were used in waterflooding experiments on core samples. Pressure drop profiles, oil recovery factors and relative permeability curves of water and oil for the water-wet rocks were evaluated. These are the most interesting results in the Thesis and published papers.

Formal aspects
The thesis is rich in easy to follow cartoons explaining the complex phenomena and processes. This will be very important in the future teaching of Mr. Jagar Ali.

Conclusions

It is my conclusion, that the Habilitation Thesis of Dr. Jagar Ali is of very high scientific value, the published papers prove the required qualification of the author. Provided the defense is successful, and I believe it is going to be successful, I recommend the Committee to confer Dr. Jagar Ali the academic degree Associate Professor.

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Questions to the author Dr. Jagar Ali

1. What is in your opinion the way to future industrial application of the green nanocomposites in EOR – how can by the green plant based material produced in tons or hundred tons and supplied to oil companies?
2. Probably the best results of the lab experiments result of fresh and distilled water, or at least low salinity (low TDS) water. How should we apply the green nanofluid mixtures, when the oil field formation water is usually a brine (salty water).

8th Dec, 2023 Juraj Franců

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