

## RESEARCH

### NEGATIVE VISCOSITY ANOMALY IN LIQUID PETROLEUM PRODUCTS AFTER HEAT TREATMENT

I. N. Evdokimov, D. Yu. Eliseev, and N. Yu. Eliseev

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*Heat treatment is a common method of improving the properties of heavy crude oils and petroleum products. Measurements showed for the first time that after heat treatment at 28-40°C, the rheological parameters of petroleum systems become much worse. The results obtained are important for improving shipping and storage technologies in conditions of periodic temperature drops. A theoretical explanation of these effects is given with consideration of the phase diagrams of petroleum systems and thermally induced changes in their colloidal structure.*

The rheological properties are the most important properties of natural crude oils, heavy oil fuels, and residues. These properties determine the methods and duration of liquid-handling operations, shipping and pumping conditions, pressure loss during transport in pipelines, etc. One common method of modifying the rheological properties of heavy crude oils and petroleum products is heat treatment.

Monographs on transport of crude oils and petroleum products usually emphasize that heat treatment significantly improves their rheological properties [1]. Handbooks [2] also note the “positive” viscosity anomaly characteristic of all heavy oil fuels and residues: after heat treatment, the viscosity determined again at the same temperature is lower than the initial viscosity. These effects of heat treatment are assumed to be correlated with the presence of waxes in the treated liquids.

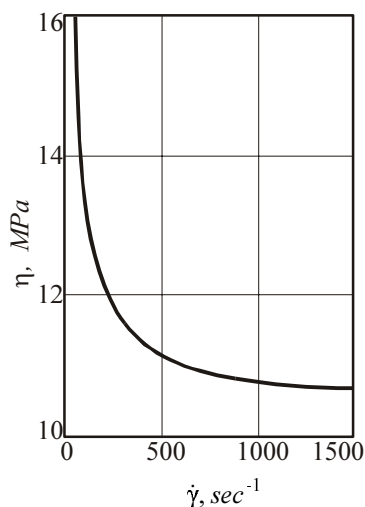


Fig. 1. Dynamic viscosity  $\eta$  vs. shear rate for a solution of vacuum resid.