

THE EFFECT OF AGE HARDENING ON THE STRUCTURE OF ASPHALTENES DERIVED FROM ARABIAN ASPHALTS

BY

Mohammad Farhat Ali and Mohammad Nahid Siddiqui
Department of Chemistry
King Fahd University of Petroleum & Minerals
Dhahran 31261, Saudi Arabia
(E-mail: mfali@kfupm.edu.sa)

ABSTRACT

Asphalt and asphalt-based materials are known for their hardening during construction and field aging. While a certain amount of change can be tolerated, it is important for the users to ensure that the materials possess the necessary properties, such as proper viscosity, temperature susceptibility and long-term performance ability, at the time of road construction and placement. In this work, the chemical properties of a commercial grade Arabian Gulf asphalt was evaluated. The rolling thin film oven (RTFO), termed as short-term aging, and pressurized aging vessel (PAV), termed as long-term aging, tests were used to simulate the laboratory aging of the asphalt. The Corbett fractionation procedure was used to separate asphalt into four fractions such as asphaltenes, polar aromatics, naphthene aromatics, and saturates. NMR and FTIR spectroscopic techniques were used to investigate the effect of different oxidation schemes on the chemical composition and nature of asphaltenes. NMR measurements of asphaltene fractions showed that during the oxidation, isomerization and dehydrogenation types of reactions took place. IR measurements found that on aging the weight percent of oxygen as carbonyl and sulfur as sulfoxide group types increased. Prominent dissimilarities were observed between the chemical structure and composition of asphaltenes. Coupling the results from the NMR and IR techniques has provided some interesting information concerning the chemical composition of asphaltenes occurred during the oxidation of asphalt.

The authors wish to acknowledge the support of King Fahd University of Petroleum and minerals, Dhahran, Saudi Arabia.