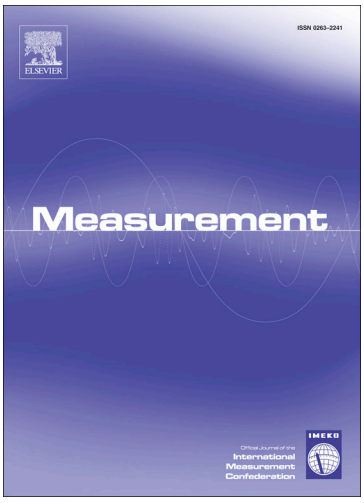

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Applications of Fourier Transform Infrared Spectroscopy Technologies on Asphalt Materials

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Abstract:

Fourier transform infrared spectroscopy (FTIR) has been widely used as a fast and accurate tool for detecting and analyzing organic materials for several decades since it was initially introduced to study the asphalt material. Since FTIR is able to distinguish asphalt at the molecular level, thus providing researchers an opportunity to explore the asphalt chemical characteristics. This review focused on evaluating the application of FTIR technologies in exploring the characteristics of asphalt material. The basic principle of FTIR and its test methods were briefly introduced. In addition, the main applications of the FTIR on asphalt were divided into three parts, including materials recognition, processing recognition and aging recognition in this review. The purpose of this review article is to provide the reference and guidance for researchers who intend to use FTIR to discover the aging characteristics and mechanism of the modified asphalt as well as some other special applications.

Keywords: *FTIR, Functional Groups, Asphalt, Aging, Molecule, Recognition*

1. Introduction

Various kinds of modified asphalts have been developed to meet the requirement of the asphalt pavement [1]. The appearance of modifier greatly improved the asphalt performance (rutting resistance, low-temperature performance, fatigue property etc.) as well as solved many pavement diseases to extend the pavement service life. However, the modification mechanism of the asphalt has not been fully revealed because of the complexity of asphalt and modifier. Fourier transform infrared spectroscopy (FTIR) provides a convenient and reliable method for analyzing the modified mechanism at the molecule level by identifying the difference of the absorption spectrum that represents the functional groups and contents in asphalt.

Another problem in pavement construction is aging effect. Asphalt can be divided into four components, asphaltenes, resins, aromatics and saturates according to the molecule weight and chemistry structure [2]. These light components can be volatilized during the service life and more asphaltenes are generated under the oxidation procedure. The change of the component makes asphalt stiffer and reduces