

Effects of food-based bio-additive on the rheological and adhesion properties of bitumen

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Abstract

In recent times, the need for the synthesis of biodegradable materials has facilitated the drift of the asphalt industry towards eco-sustainable and cost compatible production of road pavements. The principal additives in the asphalt industry either contain heavy metals or in one way or another contribute largely to atmospheric and environmental pollution. Most of the additives used in the asphalt industry are used to improve the performance of road pavements and increase its lifespan are majorly rheological modifiers, adhesion promoters and anti-oxidant agents. Rheological modifiers increase physico-chemical properties such as transition temperature of asphalt binder (bitumen), adhesion promoters increase the affinity between binder and stone aggregates while anti-oxidant agents reduce the effects of oxidation caused by exposure to air, water and other natural elements during the production of asphalt pavements. In this study, we tested the effectiveness of a food grade bio-additive on these three aforementioned properties. The modified bitumen samples were broken down into asphaltenes and maltenes in order to visualize any possible changes the additive had on these bitumen fractions using Electron Microscopy. We also sought to hypothesize the mechanisms by which the additive confers these desired features on bitumen. We present this study to evaluate the effects of a food-based eco-friendly additive on bitumen. The study was conducted through Dynamic Shear Rheology (DSR), Nuclear Magnetic Resonance (NMR) diffusometry, Atomic Force Microscopy, Scanning Electron Microscopy (SEM) and Boiling test analysis.

Biography

Abraham Abe is a young researcher who is carrying out his Doctoral studies in the department of Chemistry and Chemical Technologies at the University of Calabria, Italy. His research focuses on Physical chemistry characterization of macromolecules of interest (colloidal systems and biomolecules). Development of eco-friendly bioadditives for bituminous systems. Light and atomic force microscopic analysis of biomaterials, colloidal systems and membranes. He also has background studies in Biotechnology and has carried out several projects in this field. Some of his previous research experience was carried out at University College London and Bowen University, Iwo.



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