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Behaviour of Hot Mix Asphalt Incorporating Untreated and Treated Waste Cooking Oil

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Abstract

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Abstract

The recyclability of waste cooking oil (WCO) as rejuvenator for aged asphalt mixture improved the serviceability of pavement itself. Currently, the researcher is exploring the new potential of WCO as modifier for binder modification. However, the issue of compatibility properties in the modification of binder with WCO arises since the poor mechanical performance of asphalt mixture is globally recorded thus reflected the weakness of adhesion bonding inside the pavement material. Basically, the superior mechanical performance of asphaltic concrete exhibited good adhesion bonding between binder-aggregates interaction in bituminous mixture. In fact, the potential of high adhesiveness binding properties is affected by the chemical theory which is mostly related to the polarity factor. Therefore, it is vital to conduct the chemical analysis and microstructure observation to obtain a comprehensive understanding of the polar group behaviour for the internal structure in pavement material that influencing the adhesion performance for the structural arrangement material in the mixture. Therefore, excellent adhesion is capable of improving mechanical performance of Hot Mix Asphalt (HMA). The identification of chemical composition for polarity group determination was identified by using Gas Chromatography-Mass Spectrometry (GC–MS). Meanwhile, the adhesiveness measurement between binder-aggregate interactions in the mixture was observed with Field Emission Scanning Electron Microscope (FESEM) which physically resulting in mechanical performance by conducting resilient modulus test, dynamic creep test and indirect tensile strength

(ITS) test. Results showed that the incompatibility characteristic is revealed between untreated WCO and conventional binder (PEN 60/70) based on the identification of polar and non-polar compounds interaction. Thereby, exhibits the existence of gap and void structure arrangement in HMA through FESEM visualization hence affecting the poor mechanical strength of asphalt mixture.

Author keywords
Adhesion; Hot mix asphalt ; Polarity; Waste cooking oil

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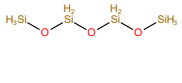
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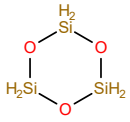
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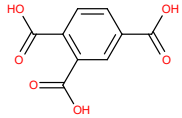
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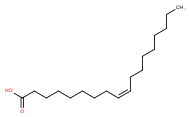
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Engineering controlled terms
Adhesion; Adhesives; Aggregates; Asphalt pavements; Binding energy; Chemical bonds; Concrete aggregates; Concrete mixtures; Gas chromatography; Mass spectrometry; Mixtures; Oils and fats; Scanning electron microscopy; Tensile strength; Waste treatment

Engineering uncontrolled terms
Chemical compositions; Field emission scanning electron microscopes; Gas chromatography-mass spectrometry; Indirect tensile strength; Mechanical performance; Microstructure observation; Resilient modulus tests; Structural arrangement

Engineering main heading
Asphalt mixtures

Topic name
Asphalt Mixtures; Rutting; Textures

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