

## Investigation on Compatibility Property Between Aggregates and Bitumen Modified with Untreated and Treated Waste Cooking Oil

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### ABSTRACT

The superior performance of asphaltic concrete exhibited the good adhesion bonding between binder-aggregates interaction in bituminous mixture. However, the issue of compatibility properties in modification of binder with waste cooking oil (WCO) arises since the poor mechanical performance of asphalt mixture is globally recorded thus reflected the weakness of adhesion bonding inside the pavement material. In fact, the potential of high adhesiveness binding properties is affected by the chemical theory which is chemical composition thereby effecting to the surface microstructure arrangement in bituminous mixture. Therefore, it is vital to conduct the morphology and microstructure observation in order to obtain a comprehensive understanding on the behaviour of the internal structure in pavement material that influencing the adhesion performance. The identification of chemical composition is determined by using Gas Chromatography-Mass Selective (GC-MS). Meanwhile, the surface microstructure observation for asphalt mixture is performed with Field Emission Scanning Electron Microscope (FESEM). Results showed that the incompatibility characteristic is revealed based on the GC-MS result, which discovered the identification of polar compounds in control binder and treated WCO while untreated WCO is recognised as a non-polar compound. The FESEM image illustrated that the more compacted structure arrangement existed in treated WCO mixture compared to the control and untreated WCO mixtures.

### KEYWORDS

Adhesion; Chemical composition; Surface microstructure

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## REFERENCES

1. American Society for Testing Materials (2012) ASTM E2090. Standard specification test method for optical and scanning electron microscopy. ASTM International, Philadelphia, U.S
2. Azahar WNAW, Jaya RP, Hainin MR, Bujang M, Ngadi N (2017) Mechanical performance of asphaltic concrete incorporating untreated and treated waste cooking oil. *Constr Build Mater* 150:653–663
3. Bahia HU, Hanz A, Kanitpong K, Wen H (2007) Testing method to determine aggregate/ asphalt adhesion properties and potential moisture damage. WHRP 07-02, Wisconsin Highway Research Program, Madison, Wisconsin
4. Borhan MN, Suja F, Ismail A, Rahmat RAOK (2009) The effects of used cylinder oil on asphalt mixes. *Eur J Sci Res* 28(3):398–411
5. Kheang LS, May CY, Foon CS, Ngan MA (2006) Recovery and conversion of palm olein-derived used frying oil to methyl esters for biodiesel. *J Oil Palm Res* 18:247–252
6. ...