UNIVERSITI TEKNOLOGI MARA

EFFECT OF VISIBLE LIGHT TRANSMITTANCE (VLT) AND VENTILATION MODES TO VEHICLE INDOOR AIR QUALITY (VIAQ)

NOOR HAFIZ BIN NOORDIN

Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 8th November 2017 to conduct the final examination of Noor Hafiz Bin Noordin on his Master of Science thesis entitled "Effect of Visible Light Transmittance (VLT) and Ventilation Modes to Vehicle Indoor Air Quality (VIAQ)" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The panel of Examiners was as follows:

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

Vehicle indoor air quality (VIAQ) has become a highly important field of research since people spend much of their time inside vehicle cabin. Volatile organic compounds (VOCs) and airborne particles are the main pollutants inside vehicle cabin. A high exposure to organic compounds and airborne particles may affect the human health. Several types and sizes of VOCs and airborne particles can be found inside vehicle cabin. This study was conducted to analyse the effect of indoor temperature to the concentration of formaldehyde, benzene, toluene, ethylbenzene, o-xylene (BTEX) and particulate matter ($PM_{2.5}$) inside vehicle cabin by applying window tints with different levels of visible light transmittance (VLT). Among the sampling methods used in indoor air quality research, direct-reading instrument and active air sampling are the methods usually applied to measure the air quality level inside vehicle cabin. This study used direct-reading instrument which are environmental monitoring instrument (EMI) and gas tracer to measure the concentration of formaldehyde and $PM_{2.5}$. Meanwhile, active air sampling and analysis using gas chromatograph equipment was employed to identify the concentration of benzene, toluene, ethylbenzene and o-xylene (BTEX). It was found that high indoor temperature with heat accumulation will accelerated the melting process of interior material, where the concentrations of formaldehyde were increased up to 2 to 3 times from the initial condition during static test. Whereas, by applying window tints with 30% VLT level, the concentrations of formaldehyde and BTEX were reduced by 45%, 40%, 47%, 51% and almost 100%, respectively. However, the influence of ventilation modes to the formaldehyde, BTEX and $PM_{2.5}$ concentration was more dominant compared to indoor temperature during the mobile test, in which the concentrations changed significantly under several ventilation modes.

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