**THE EDUCATION UNIVERSITY OF HONG KONG**
FACULTY OF LIBERAL ARTS AND SOCIAL SCIENCES

**Research Output/Impact/Knowledge Transfer Prize**
**for the Dean's Research Fund 2018-19**

**Brief Introduction of Awardee's**
**Research/KT Publication/Study/Output and Future Research/KT Development**

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| **Awardee (Dept):** | Dr. Ho Wing Kei, Associate Professor (SES) |
| **Publication Title/KT project:** | Graphene-induced formation of visible-light-responsive SnO2-Zn2SnO4 Z-scheme photocatalyst with surface vacancy for the enhanced photoreactivity towards NO and acetone oxidation |

*A. Briefly introduce your research/KT publication/study/output for which you have received the prize.*

This summary describes the significance of the refereed research article titled "Graphene-induced formation of visible-light-responsive $SnO_2$-$Zn_2SnO_4$ Z-scheme photocatalyst with surface vacancy for the enhanced photoreactivity towards NO and Acetone", published in the *Chemical Engineering Journal* in Nov 2017. The *Chemical Engineering Journal* is a world-class journal and ranked 3 out of 50 in "Environmental Engineering" and 7 out of 137 in "Chemical Engineering", categories in the JCR Field area of the Journal Ranking.

$Zn_2SnO_4$ was studied as a promising candidate in the photocatalytic application. In this published article, visible-light-responsive photocatalyst $SnO_2$-$Zn_2SnO_4$/graphene was successfully fabricated for the first time,by a facile one-pot hydrothermal reaction strategy. It was found that the presence of graphene not only induces the formation of $SnO_2$, but also introduces Sn vacancy, which can trigger the visible light photocatalytic activity, and reduced graphene oxide (rGO) performed as an effective electron mediator.

The photocatalyst loaded with optimum amount of graphene shows the highly efficient photocatalytic reactivity in oxidation of NO and acetone under visible light illumination. Graphene can efficiently transfer the photo-produced electrons from the conduction band of $Zn_2SnO_4$, retarding the recombination of carriers and therefore enhancing the visible photo-reactivity. A Z-scheme model was proposed for the photocatalytic oxidation of NO and acetone over $SnO_2$-$Zn_2SnO_4$/graphene hybridized photocatalyst, and both $^{\bullet}O_2^-$ and $^{\bullet}OH$ radicals are identified to be the main ROSs that should be responsible for the oxidation of NO and acetone. When compared with normal $Zn_2SnO_4$ which was prepared in the absence of graphene, Z-scheme $SnO_2$-$Zn_2SnO_4$ heterostructures with vacancies obviously display much higher photocatalytic activity because of the enlarged BET

specific surface area, improved light-harvesting ability and promoted separation of photo-generated carriers. More importantly, the highly outstanding photocatalytic stability firmly demonstrated that this kind of Zn2SnO4-based Z-scheme photocatalytic systems is potential and promising to address the current environmental and energy crises hampering the modern industrial development.

B. *How you used/will use your prize and perhaps its usefulness to your research/KT development?*

The fund would be used to hire research staff to obtain preliminary experimental results for the application of a new GRF.

C. *Expected research/KT outcomes/outputs/impacts arising from this prize.*

The data collected from this fund will support the development of a GRF proposal.