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 2019/20

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

Awardee (Dept):	Dr Ho Wing Kei, Associate Professor (SES)
Publication Title/KT project:	Engineering of incorporation the reduced graphene oxide on nanosheet–g-C_3N_4/perylene imide heterojunction for enhanced photocatalytic redox performance

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

Numerous crucial challenges still exist in NO_x removal. The traditional methods for nitrogen oxides (NO_x) removal mainly include selective catalytic reduction, wet absorption technique, and selective catalytic oxidation. However, these methods are applicable only to factory air ducts and other settings with high concentrations of NOx and high temperatures. These methods are ineffective in removing NOx that has been released into the atmosphere. These methods can be used to process NOx from the source. However, the processing efficiency of these methods is less than 100%; thus, a large amount of NOx tends to permeate the air. If people are exposed to low concentrations of NOx for long periods, they can easily develop bronchitis, emphysema, lung cancer, and other incurable diseasesIn particular, NO accounts for 95% of NOx emitted in the air. . In this study, a highly efficient, simple and low-cost NO_x removal approach using visible-light-driven photocatalysts with Z-scheme heterostructures will be developed.

The study of visible-light-driven photocatalysts with Z-scheme heterostructures on their interface charge transfer and photocatalytic mechanism toward NO_x removal are rare. It has been shown that the photonic efficiency of NO removal can be additionally promoted through the accumulation of electrons on the specific surface. In this project, we propose to synthesize NCN/PI/rGO photocatalyst with heterostructures. The CB electrons in the PI can combine with the VB holes of NCN via the Z-scheme pathway (electron transfer I, PI→NCN) because PI is grown in situ on the NCN through thermal condensation polymerisation. This polymerisation

allows the intimate contact between NCN/PI and a short charge-transfer distance. The electrons remaining in the CB of NCN thereafter flow into rGO (electron transfer II, PI→NCN→RGO). Thus, the simultaneous occurrence of electron transfers I and II results in the accumulation of electrons on the rGO surface, hence creating the photonic efficiency of NO removal.

Our research underlines the importance of an organic semiconductor-based Z-Scheme heterojunction and gives impetus to manipulation of photo-oxidation pathway. Our results showed that the NCN/PI/rGO heterojunction had high efficiency and good stability in the photocatalytic process of removing NO. Lastly, to the regard of environmental impact, this work introduces an efficient and inexpensive method to remove harmful ambient NO pollution, bringing a new way to use solar energy to solve air pollution.

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.