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

Research Output/Impact Prize for the Dean's Research Fund 2017-18

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

Awardee (Dept):	Dr. Chow Cheuk Fai, Associate Professor (SES)
Publication Title:	Catalyst Displacement Assay: A Supramolecular Approach for the Design of Smart Latent Catalysts for Pollutant Monitoring and Removal

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

New latent catalytic system so called catalyst displacement assay (CDA) has been developed in this study. This supramolecular system can execute not only smart off-on sensing but threshold-controlled catalysis to control targeted reactions.

The development of "smart" catalysts for process monitoring and reaction control is highly important in modern chemistry. In particular, a smart catalyst that is able to execute a specific task under certain conditions would be very attractive. Different from traditional catalysts that initiate a reaction once the reactants are present, this type of catalyst would provide extra benefits for certain industrial processes such as contaminant removal during water treatment.

In this publication, three cyano-bridged bimetallic complexes were synthesized as "smart" latent catalysts by the supramolecular assembly of different metallic donors ($[Fe^{II}(CN)_6]^{4-}$, $[Fe^{II}(t\text{Bubpy})(CN)_4]^{2-}$, and $Fe^{II}(t\text{Bubpy})_2(CN)_2$ with a metallic acceptor $[Cu^{II}(\text{dien})]^{2+}$. The investigation of both their thermodynamic and kinetic properties on binding with toxic pollutants provided insight into their smart off-on catalytic capabilities, enabling us to establish a threshold-controlled catalytic system for the degradation of pollutants such as cyanide and oxalate. With these smart latent catalysts, a new catalyst displacement assay (CDA) was demonstrated and applied in a real wastewater treatment process to degrade cyanide pollutants in both domestic (level I, untreated) and industrial wastewater samples collected in Hong Kong, China.

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

This discovery may shed new light on how to real-time monitor and treat other dangerous chemical wastes. The scientific background of how the device can take up multi-functions simultaneously for detection, amplification, and elimination upon detection of cyanide is now being understood. The researchers will further explore the feasibility of designing other new smart devices for detection and degradation of various hazardous chemical wastes, such as oxalate, azo dyes, carboxylic acids, and organophosphate pesticides. Finally, the team will continue to establish this new technology on the complicated industrial wastewaters, which is composed of a mixture of the toxics rather at high concentrations.

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

By gathering all the resources, we hope to create new perspectives and ideas to solve the problems of toxic substances. Furthermore, we would like our research results to be used to improve our society.