Prof Chun-Sing LEE

- Chair Professor of Materials Chemistry
- Head of Chemistry Department
- Director of Center of Super-Diamond & Advanced Films (COSDAF)
- Editor-in-Chief of Materials Today Energy
- WeChat ID: CityU_CSLee; Scopus ID: 16464316100

Research areas:

- Nanomaterials for energy (batteries, supercapacitors, solar cells, photocatalysis etc) & biomedical applications (imaging, drug delivery, cancer therapy)
- Organic optoelectronics (OLEDs, OPV, memory)
Dr K C Lau
BSc (PolyU), M.Phil. (CUHK), Ph.D. (UC Davis)
Associate Professor, Department of Chemistry, City University of Hong Kong

*ab initio* predictions for

- Thermochemical and spectroscopic properties for main-group compound and transition-metal complexes
- Reaction mechanisms for catalytic reactions involving
  - C-H activation
  - CO$_2$ reduction
  - H$_2$O oxidation and O$_2$ generation
- Development of theoretical CCSD(T)/CBS methods for accurate predictions.

Interested student may directly contact Dr Lau by email: kaichung@cityu.edu.hk
Research highlights – Prof. Michael H. W. Lam (Department of Chemistry)

**Smart stimuli-responsive materials**

- Specific peptide-crosslinked hydrogels with built-in signal amplification mechanisms for the detection of pathogenic bacteria in food and clinical samples.

- Molecularly imprinted hydrogels with novel functionalized protein-based binders for the recognition and capturing of cancer cells.

- Smart shape-memory hydrogels with genomic DNA-crosslinkers.

- Polymer brushes with electroresponsive intermolecular charge-transfer properties for reflective displays.

- Janus nanoplatelets for reflective displays.

- pH-responsive organometallic polymers based on a molecular pivot-joint machinery.

*pH* responsive photonic colloidal crystalline beads for *in vivo* imaging applications developed by Michael Lam’s group, CityU, HK SAR
1. Phosphorogenic probes for biomolecules

(a) Iridium(III) nitrone complexes

\[ \text{BCN-DPA} \rightarrow \text{BCN-C10} \]

\[ \text{IC}_{50} = 795.1 \]

(B) Biothiols


\[ \text{M.W.} = 800 \]

\[ \text{M.W.} = 1116 \]

Biothiols

Weakly emissive complexes

Strongly emissive complexes

\[ \text{NO}_2 \]

\[ \text{Ir} \]

\[ \text{N} \]

\[ \text{H} \]

\[ \text{O} \]

\[ \text{NO}_2 \]

\[ \text{C} \]

\[ \text{N} \]

\[ \text{Ir} \]

\[ \text{N} \]

\[ \text{N} \]

\[ \text{NH}_2 \]

\[ 1a \]

\[ 1b \]

Chemical Communications 2016, 52, 4557 – 4560.

2. Novel photocytotoxic agents

(a) Iridium(III) phenylboronic acid complexes

(b) Ruthenium(II) fructose complexes


3. Membrane-staining probes

(a) Iridium(III) dinitrophenyl ether complexes

(b) Ruthenium(II) fructose complexes


Doris Au
DA LAB

Research focus
Applying omics, molecular, biochemical and cellular approaches, together with relevant whole organismal phenotypic endpoints, to identify underlying molecular mechanisms, chemical –DNA interactions and to risk assessment.

EE2/EDCs
- Transgenerational impact on reproduction and immune function
- Epigenetic and genetic
- Transgenerational skeletal
- Deformities
- miRNA - mRNA deregulation
- Harmful algal toxins
- Antimicrobial peptides
- Chemistry and bioactivity

BaP/PAHs

Natural products

Research Interests
Investigation of multigenerational toxicity, with special interest in studying transgenerational inheritance of skeletal deformity, reproductive and immune impairments induced by environmental contaminants and physical stresses (including EE2, BaP and natural toxins).

Research Expertise
- Establishment of multiple medaka models for toxicology.
- Whole fish histology array and embryp chips for multiple molecular analysis in vivo.
- Unique transgenic medaka and CRISPR-Cas9 knockout medaka models for bone development study.

Environment and Human Health

Cross-generational: directly (somatic or germ cell) exposed generations

Transgenerational: completely unexposed generations

= Environmental stressor
= Direct somatic cell exposure to stressor
= Direct germ cell exposure to stressor
= Germ-cell epigenetic modifications inherited over generations
My research group is interested in the search and elucidation of the functional roles of novel proteins/miRNAs/mechanisms/pathways that may be associated with hypoxia- and xenobiotic-induced endocrine disruption in fish. Laboratory and/or field studies by our group have previously demonstrated that hypoxia and certain endocrine disruptors impair testicular development, reduce sperm production/motility and deregulate various signaling pathways in male fish (Fig. A). Importantly, we demonstrated that hypoxia-induced reproductive impairments and epigenetic changes in F0 males were transgenerationally transmitted to the F1 and F2 males (Fig. B). Retardation of gonadal development by hypoxia was also observed in the fish ovary. RNA-seq transcriptome profiling of hypoxic testes and ovaries of the marine medaka (Oryzias melastigma) followed by Gene Ontology (GO), KEGG and Ingenuity Pathway (IPA) analysis revealed differential expression of gender-specific signaling pathways in male and female marine medaka (Fig. C). The regulatory effect of hypoxia on medaka ovary included activation of progesterone synthesis, activation of internal genitalia development, and inhibition of atresia of the reproductive tract. In contrast, the regulatory effect of hypoxia on testis included modulation of signaling pathways related to cell growth and apoptosis such as G2/M DNA damage checkpoint regulation, p53 signaling and VEGF signaling. Additionally, based on recent evidence from our group, it is hypothesized that the activation or inhibition of specific hypoxia-responsive miRNAs, directly targeting the expression of the androgen receptor (AR) or coregulators of AR signaling, represent an important pathway that controls sexual differentiation and development in fish. Studies to verify this are currently underway in my lab. The possibility that certain endocrine-disrupting chemicals (EDCs) that are obesogenic may have a role in disrupting reproductive functions in fish is also an area that is being investigated in my lab.
Hybrid Organic EO Materials: Femtojoule Modulation, Broadband RF and Terahertz Photonics, and Quantum Electro-Optics

\[ \Delta n = n^3 r_{33} E / 2 \]

Organic Photonics:
Materials Chemistry and Processing

\[ r_{33} \approx -2 \chi^{(2)} / n^4 \]

Dielectric photonics
Nanophotonics, nanoplasmonics
Terahertz Nonlinear Photonics

Exabytes per Month

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<th>Region</th>
<th>2016</th>
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<th>2018</th>
<th>2019</th>
<th>2020</th>
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<td>7%</td>
<td>8%</td>
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47% CAGR 2016-2021

Luo Lab: http://www.cityu.edu.hk/chem/profile/drjdl.html
Chi-Kit Andy Siu  
Computational Chemistry  
Physical Organic Chemistry  
chiksiu@cityu.edu.hk

Theoretical Studies of Gas-Phase Ion Chemistry with Quantum Chemical Computations in Collaboration with Experimental Research Groups in Mass Spectrometry

Atmospheric Chemistry and Reaction Mechanisms in Hydrated Cluster Models  
Collaborator: MK Beyer, University of Innsbruck, Austria

Free electron:  
The lightest possible catalyst

Electron transfers with hydrated electron

Evolution of spin density

Structural Characterization & Reaction Mechanisms of Bio-molecular Ions in the Gas Phase  
Collaborator: Ivan K Chu, University of Hong Kong

Histidine  
\[ \alpha \text{-radical} \]

Intramolecular Charge/Electron Transfers

\[ [G,W^+]^* \]  
\[ [GGW^-]^* \]
Research Focus:

(1) Activation of Alkynes by Transition Metals
(2) Design of Metal-Heterocyclic and Metallacyclic Complexes
(3) Development of Novel Metallodrugs
(4) Nanoscale Drug Delivery System
Anticancer Drug Development: Multi-targeted Anticancer Agents and Cancer-Specific Nanomedicine

Dr. Guangyu Zhu
guangzhu@cityu.edu.hk  www.zhulab.com

Dual-targeted Anticancer Agents

Drug Mechanism and Target Validation

Immuno-chemotherapeutic Nanohybrid

Representative publications:

Angew. Chem. Int. Ed. 2018, 57, 9098
Angew. Chem. Int. Ed. 2018, 57, 3426
Chem. Sci. 2017, 8, 6865
Angew. Chem. Int. Ed. 2016, 55, 15564 (VIP and cover)

J. Am. Chem. Soc. 2015, 137, 383
Nat. Commun. 2014, 5, 4466
Angew. Chem. Int. Ed. 2013, 52, 13419
Angew. Chem. Int. Ed. 2013, 52, 2027
Exploring the Chemistry and Biology of Nucleic Acids  
Dr. Chun Kit KWOK (ckkwok42@cityu.edu.hk)

Kwok Lab (https://kitkwok.com)

Representative Publications:
Nat. Methods https://doi.org/10.1038/s41592-018-0121-0 (2018)
Nature. 505, 696-700 (2014)

Our Research Vision

Key Collaborators:
UK--University of Cambridge , University of Oxford, etc
US--Cornell University, University of California, Davis, etc
Asia--National University of Singapore, Tsinghua University, etc
Hong Kong--University of Hong Kong, Chinese University of Hong Kong, etc

Postdocs and PhDs needed for RNA biology work!!!
Combination is the key, we will be the best

Physics + Chemistry + …

1. Synthesis of 2D materials, nanomaterials
2. Defects engineering of 2D materials, nanomaterials

What is my goal?

Chicken or Egg?

Before using it, we need to understand it.

How strong/ flexible 2D materials can be?

How does the 2D materials interact with other materials and substrates?

Physics + Chemistry + …

Combination is the key, we will be the best
Yudai Matsuda

Natural Product Biosynthesis & Bioengineering:
Harnessing Nature’s Synthetic Potential to Create Novel Molecules

Research Projects:
1. Elucidation of the biosynthesis of complex and bioactive natural products
2. Genomics-driven discovery and derivatization of natural products
3. Generation and evolution of “unnatural” natural product pathways

Visit: http://staffweb1.cityu.edu.hk/ymatsuda/
Heterogeneous catalysis is highly associated with “surface atomic arrangement” and “local coordination” of active site!

We can map catalyst’s surface and acquire all information such as concentration and chemical state of surface cation, anion, hydroxyl group and oxygen vacancy…etc. for the investigation of true active site!
Ruquan Ye, Ph.D.
Assistant Professor
Department of Chemistry
City University of Hong Kong
Email: ruquanye@cityu.edu.hk
Web: www.ye-lab.com

We synthesize functional materials:
1. Used laser to form porous graphene and applied them in broad fields
2. Developed active catalysts for energy storages and releasing

Do not hesitate to contact me for potential positions if interested!

Laser-assisted Materials Manufacturing

Catalysts for Energy Conversions

fuels & chemicals

catalysts

erenewable energy

earth-abundant resource

electricity
Material Innovation and Interface Engineering for Photovoltaic Device

- **Solvent Chemistry & Crystallography**
- **Flexible Devices to Roll-to-Roll**
- **Printing**

**Perovskites Solar Energy**

- **Photophysics**
- **Lead replacement for sustainable energy**

**Interfacial Engineering**

Adv. Mater. 2016, 28, 10786;

Chem. Mater., 2018, 30, 1556

Energy Environ. Sci., 2015, 8, 1160

Adv. Mater. 2018 30, 1703800;