

City University of Hong Kong -School of Energy and Environment
List of Summer Internship Projects 2017 (Program date: 6/19-8/11, 2017)

No.	Supervisor	Topic Title	Short Description	Prerequisites
1	Dr. Wey Yang Teoh Associate Professor, School of Energy and Environment	Converting Wastewater to Electricity	The project looks into the construction of photocatalytic fuel cells (PFCs) capable of converting wastewater to electricity under solar irradiation. Organic-laden wastewater is an electron-rich source that can be extracted during the oxidation of the organics (as part of wastewater treatment). Here, solar-activated photoanodes will be used to extract these charges from the organics, and in the process generate electricity.	Interest in Chemistry or Physics
2	Dr. Zhi NING <i>Assistant Professor, School of Energy and Environment</i>	Data Analysis on Mobile Air Sensor Network for City Wide Roadway Traffic Emission Estimation	The project will be part of the major investigation on the development of a first ever mobile sensor network along the roadway network in Hong Kong. PM and gas pollutants were measured through 10 home made air sensor systems on the bus platforms. The big data generated from the network would be precious for the analysis of impact on roadway traffic on urban air quality.	Data analysis skills using programming of R or Matlab or Python. Students with hands on engineering experience are preferred.
3	Prof Michael LEUNG <i>Professor, Associate Dean (Undergraduate Studies) School of Energy and Environment</i>	Development of Photocatalytic Fuel Cell	Photocatalytic fuel cell (PFC) is a synergistic integration between two emerging technologies, namely, photocatalysis (PC) and fuel cell (FC) technologies. Recent studies have demonstrated the effectiveness of the new PFC approach in solving environmental and energy problems, e.g. simultaneous wastewater treatment and electricity generation. PFC is also applicable to food waste, agricultural residues, sludge, industrial organic waste, etc. The potential of PFC is enormous. In this project, the student may emphasize the research on nanomaterials for better photoelectrodes or photocatalytic-electrochemical mechanisms for improved cell performance.	Knowledge/experience preferred: photocatalysis, fuel cell
4	Dr. Sam HSU Assistant Professor, School of Energy and Environment	Establish Organometallic Complexes Containing Nickel Phosphine Complex Catalysts for Solar Hydrogen Production	Hybrid organometallic complexes have attracted considerable attention because of their potential application in photovoltaic cells and solar-fuel devices. Transition-metal complexes can play an important role in providing efficient energy transfer, balanced charge injection/ transporting character and high quantum efficiency in the devices. In this project, students will be trained to establish polymer/organometallic catalyst assembly for solar hydrogen generation by employing using ultrafast transient absorption and time-resolved photoluminescence.	Experience in material science, organic chemistry, physical chemistry and/or solar energy application is a plus but not required.

5	Dr. Sam HSU Assistant Professor, School of Energy and Environment	Hybrid Organic-inorganic Materials for Solar Energy Applications	Hybrid organometallic perovskite materials have been rapidly adopted for solar energy applications since 2009, as a result of impressive features. This project will focus on the investigation of a variety of organic and metallic dopants for the perovskite semiconductors using ultrafast laser spectroscopy and scanning photoelectrochemical microscopy imaging.	Experience in material science, organic chemistry, physical chemistry and/or solar energy application is a plus but not required.
6	Dr. Nicky LAM <i>Assistant Professor, School of Energy and Environment</i>	Impacts of Southeast Biomass Burning on Local Air Quality of South China Sea	The students will involve using state of the art climate and air quality modelling to simulate Southeast biomass burning and understand its impacts on local air quality in South China.	Background in atmospheric science/ computer engineering / related areas or knowledge
7	Dr. Wey Yang Teoh Associate Professor, School of Energy and Environment	Indoor Photocatalytic Abatement of Odour Pollutants	The project is an industrial collaboration with HeiQ AG (www.heiq.com) in developing new photocatalytic materials for the abatement of volatile organic compounds (VOCs) and perspired odour. Here, the Z-scheme approach to photocatalysts design will be introduced into practical consumer products, where visible light activation (non-ultraviolet light) is sufficient to degrade any VOCs.	Interest in Chemistry
8	Prof. Michael LEUNG <i>Professor, Associate Dean (Undergraduate Studies) School of Energy and Environment</i>	Organic Rankine Cycle (ORC) for Recovery of Low- grade Waste Heat for Electricity Production	As air-conditioning (AC) is often the largest electricity consumer in buildings, AC has the highest potential to save substantial energy. AC waste heat recovery is a promising approach. In the past, integrated heat pump was successfully developed for recovery of AC waste heat for hot water production. Since our hot water demand is comparatively small, we still reject the remaining waste heat without production. The purpose of this project is to develop integrated organic Rankine cycle (ORC) air-conditioning systems for recovery of the AC waste heat for electricity production. The main challenge is to boost ORC in recovery of low-grade heat (refrigerant condensing at 50-60 deg-C) with high economic viability. Potential strategies include superheating/desuperheating, evaporative cooling, coordinated heating/cooling, etc.	Knowledge/experience preferred: air- conditioning, refrigeration
9	Dr. Wey Yang Teoh Associate Professor, School of Energy and Environment	Solar Remediation of Endocrine Disrupting Chemicals	Endocrine disrupting chemicals (EDCs) are emerging pollutants in wastewater. Despite being present only in trace amount, normally in low ppm to ppb levels, they are capable of disrupting the hormonal functions of humans and wildlife. Here, the project looks into the design of effective photocatalysts that are capable of degrading EDCs under freely available solar light.	Interest in Chemistry

10	Dr. ZHANG Lin Assistant Professor, School of Energy and Environment	The Effects of Institutions on the Energy Consumption in Taiwan	Social and political institutions are important drivers for economic growth, as witnessed in many studies in the literature. Energy consumption and economic growth are interlinked. It is therefore that the institutions affect the energy consumption. This project will study the relationship between energy consumption and institutions, and test how strong the effect is in Taiwan.	Statistics, Economics, Econometrics
11	Dr. Sam HSU Assistant Professor, School of Energy and Environment	The Optimization of Doped Hybrid Perovskite Semiconductors	Organic-inorganic perovskite semiconductors show many excellent photophysical and photoelectrochemical properties. This project will focus on the investigation of photophysics and photoelectrochemistry for the perovskite semiconductors using ultrafast laser spectroscopy and scanning photoelectrochemical microscopy imaging.	Experience in material science, organic chemistry, physical chemistry and/or solar energy application is a plus but not required.
12	Dr. Patrick Sit Assistant Professor, School of Energy and Environment, City University of Hong Kong	Computational Study and Design of Systems for Energy Storage and Conversion	Computational modeling techniques have become powerful tools for the study of important scientific and technological problems due to the ever-increasing computing power and the development of efficient and accurate methodologies. In particular, first-principles density-functional simulations have been extensively used to provide realistic prediction of material properties and to unravel atomic-scale details of reaction mechanisms relevant to energy applications. This project focuses on the study of reaction in systems important for energy storage and the design of novel materials for applications like hydrogen production, carbon dioxide to fuel conversion and lithium-ion batteries.	Interested students should be perusing a degree in Physics, Chemistry, Materials Science or other related disciplines. Knowledge in quantum mechanics is required. Experience in atomistic-scale computational modeling and density functional theory is a plus.