Research Experiences for Students of Honours College (RESHC) Programme 2017

RESHC Ref. no	Institutes	Mentor	Email	Project Title	Level	Duarations	Commencement month	Project Description	Internship Requirement
RESHC/2017/033	IAPME	Bingpu Zhou	bpzhou@umac.mo	Preparation of Surface-Enhanced Raman Scattering (SERS) Substrate for sensitive detection of low-concentration bio/chemical molecules via microfluidic-assisted approach	L2 - 50 hours/month	4 months	May	Ultra-sensitive detection of bio/chemical analyte molecules is pivotal for both of fundamental scientific research and technological advances. Two main routes to improve the sensitivity is to concentrate analyte concentration and generate abundant effective 'hot-spots'. In this project, the student will focus on the preparation of substrates with surface patterns for enhancing the surface hydrophobicity and assemblies of gold nanoparticles with uniform distribution as SERS 'hot-spots'. The student will learn about the knowledge of micro-/nano-fabrication, the role of surface patterning on hydrophobicity, the 'Lab-on-Chip' system, as well as knowledge of nano-plasmonics. The captioned project is highly interdisciplinary and the internship can focus on one or two particular aspects to develop his/her interest on the relative sciences and technologies.	1. The internship should be conscientious on the work allocated. 2. It is better that the internship has background in physics or electrical engineering (EE). 3. The internship should be passional with science and technological advances.
RESHC/2017/034	IAPME	HUAIYU SHAO	hshao@umac.mo	Design and Development of Hydrogen Storage Materials by Experiment and Simulation Approaches	L1 - 40 hours/month	6 months	June	This project is aiming at development of novel hydrogen storage systems to combine with hydrogen production and fuel cell technologies together for energy storage and utilization applications. One of the outcomes of this project is to build a demonstration system to show the concept of renewable hydrogen energy solution to store unstable renewable energy such as wind or solar power in terms of hydrogen and provide a stable energy supply. One intern is welcome to participate in design, building and testing of the various components for this concept and make a	The potential intern is expected to have * some basic knowledge about science and engineering; * some scientific project experience in middle/high school (preferred but not required); * good communication skills.
RESHC/2017/036	IAPME	HAIFENG LI	haifengli@umac.mo	鉻酸鹽中新奇的磁性和多鐵性開發研究 Investigation of novel magnetism and multiferroicity in chromates	L2 - 50 hours/month	6 months	June	(1) 用兩種不同的創新方法，首次分別生長高品質的和大的單晶體，深入探究其新奇的磁學和鐵電性能。 (2) 應用新的技術手段以及現代中子和同步輻射研究，提供獨一無二的結論性實驗證據，揭示其具有新奇磁和鐵電性的微觀機理。 (3) 建立晶體和磁缺陷與其宏觀性能間的直接對應關係。該研究最終將解決多鐵領域的諸多難題，極具潛在的工業應用。	With strong desire to learn new things.
RESHC/2017/037	IAPME	HAIFENG LI	haifengli@umac.mo	在照明及發光顯示器領域極具應用前景的稀土摻雜MY2O4 (M=Ca, Sr, Ba) 化合秒單晶材料的開發	L2 - 50 hours/month	6 months	June	Main objectives & novel methods. One key step to conclusively address the above questions is to grow single crystals which provide more reliable information than poly-crystals. Our project aims to synthesize (1) the first stoichiometric and large (3-5 g) rare-earth-doped MY2O4 (M = Ca, Sr, Ba) single crystals for (2) performing decisive measurements of their luminescence properties and conclusive studies of the related microscopic origins. To achieve these goals we will utilize the novel chemical hydrothermal method
complementary with the high-pressure annealing technique, the normal (up to 8 bars) and the unique high-pressure (up to 150-300 bars) floating-zone methods for (1), and comprehensive in-house characterizations and modern X-ray/neutron scatterings with worldwide large facilities additionally supported by our theoretical DFT calculations for (2). (3) Most importantly, we would design and make possible Lab light- & field-emission devices with our best optimized single crystals.	With strong desire to learn new things.