功能纳米系统研究与应用中心

Institute of Functional Nanosystems and Applications

团队负责人：林歆怡
团队成员：林歆怡，彭应裕，吕嫣
教授：林歆怡
研究员：彭应裕
副教授：吕嫣
博士后：无

一、研究领域 / Research Fields

1.表面增强拉曼技术
2.功能纳米材料及其超晶格自组装
3.分子传感检测材料与器件
4.化学计量学与机器学习
5.纳米复合分离材料及检测一体化器件

二、研究内容 / Research Contents

1. 表面增强拉曼散射平台识别分子同系物和异构体
2. 新型超灵敏分子检测光谱传感器及其应用
3. 基于光学检测平台和机器学习的疾病快速检测
4. 基于机器学习预测模型的纳米材料快速表征
5. 高分子纳米复合分离膜与气凝胶分离材料及其分离检测一体化器件

三、代表性成果 / Representative Achievements

1. 项目
1) 教育部国家级人才项目
2) 江苏特聘教授，江苏省人才项目
3)Creating SERS Chemical Space to Identify Unknown Chemical/Disease X, National Research Foundation Investigatorship (NRFI)
4)Engineering Plasmonic Nanocrystal Super-Lattices For Emerging Optical Properties And Sensing Applications, National Research Foundation Fellowship (NRFF)
5)Portable SERS-based Breathalyzer for Rapid and Online COVID-19 Detection and Surveillance, NMRC COVID Fund

2. 获奖
1)新加坡国家研究基金Investigatorship Award（2023 ）
2)三井化学-新加坡化学会材料与纳米化学工业奖（2021）
3)南洋创新创业奖（2021）
4)亚洲明日之星Lectureship（2019）
5)欧莱雅新加坡女性科学家奖（2015）
6)亚洲和大洋洲光化学协会青年科学家奖（2014）

3. 专利
1)Platform For Stand-Off And Real-Time SERS Sensing Of Airborne Analytes. PCT/SG2020/050438
2)Superhydrophobic Platform For Sensing Urine Metabolites And Toxins. PCT/SG2019/050022
3)Breathalyzer Design For Infectious Disease Diagnosis. SG PRV 10202010712X
4)一种多酚-铁纳米薄膜及其制备方法和应用，专利号：ZL 202010100998.8
5)一种纳米纤维基有机/无机复合纳滤膜及其制备方法，专利号：ZL 202010020048.4

4. 论文

1)Leong SX, Leong YX, Tan EX, Sim HYF, Koh CSL, Lee YH, Chong C, Ng LS, Chen JRT, Pang DWC, Nguyen LBT, Boong SK, Han X, Kao YC, Chua YH, Phan-Quang GC, Phang IY, Lee HK, Abdad MY, Tan NS, Ling XY*. Non-Invasive and Point-Of-Care Surface-Enhanced Raman Scattering (SERS)-based Breathalyzer for Mass Screening of Coronavirus Disease 2019 (COVID-19) under 5 Minutes. ACS Nano 2022, 16, 2629.
2)Nguyen LBT, Leong YX, Koh CSL, Leong SX, Boong SK, Sim HYF, Phan-Quang GC, Phang IY, Ling XY*. Inducing Ring Complexation for Efficient Capture and Detection of Small Gaseous Molecules Using SERS for Environmental Surveillance, Angewandte Chemie International Edition 2022, 61, e202207447
3)Leong YX, Tan EX, Leong SX, Koh CSL, Nguyen LBT, Chen JRT, Xia K, Ling XY*. Where Nanosensors Meet Machine Learning: Prospects and Challenges in Detecting Disease X. ACS Nano 2022, 16, 13279.
4)Lee HK, Lee YH, Koh CSL, Phan-Quang GC, Han X, Lay CL, Sim HYF, Kao YC, An Q, Ling XY*. Designing Surface-enhanced Raman Scattering (SERS) Platforms Beyond Hotspot Engineering: Emerging Opportunities in Analyte Manipulations and Hybrid Materials. Chemical Society Reviews 2019, 48, 731.
5)Phan-Quang GC, Han X, Koh CSL, Sim HYF, Lay CL, Leong SX, Lee YH, Pazos-Perez N, Alvarez-Puebla RA, Ling XY*. Three-Dimensional Surface-Enhanced Raman Scattering Platforms: Large-Scale Plasmonic Hotspots for New Applications in Sensing, Microreaction, and Data Storage. Accounts of Chemical Research 2019, 52, 71844.
6)Leong SX, Koh CSL, Sim HYF, Lee YH, Han X, Phan-Quang GC, Ling XY*. Enantiospecific Molecular Fingerprinting Using Potential-Modulated Surface-Enhanced Raman Scattering to Achieve Label-Free Chiral Differentiation. ACS Nano 2021, 15, 1817.
7)Leong YX, Lee YH, Koh CSL, Phan-Quang GC, Han X, Phang IY, Ling XY*. Surface-Enhanced Raman Scattering (SERS) Taster: A Machine-Learning-Driven Multireceptor Platform for Multiplex Profiling of Wine Flavors. Nano Letters 2021, 21, 2642.
8)Lee YH, Shi W, Yang Y, Kao YC, Lee HK, Chu R, Pang YL, Lay CL, Li S, Ling XY*. Modulating Orientational Order to Organize Polyhedral Nanoparticles into Plastic Crystals and Uniform Metacrystals. Angewandte Chemie International Edition 2020, 59, 21183.
9)Kao YC, Han X, Lee YH, Lee HK, Phan-Quang GC, Lay CL, Sim HYF, Phua VJX, Ng LS, Ku CW, Tan TC, Phang IY, Tan NS, Ling XY*. Multiplex Surface-Enhanced Raman Scattering Identification and Quantification of Urine Metabolites in Patient Samples within 30 min. ACS Nano 2020, 14, 2542.
10)Sim HYF, Chen JRT, Koh CSL, Lee HK, Han X, Phan-Quang GC, Pang JY, Lay CL, Pedireddy S, Phang IY, Yeow EKL, Ling XY*. ZIF-induced d-band Modification in Bimetallic Nanocatalyst: Achieving > 44% Efficiency in Ambient Nitrogen Reduction Reaction. Angewandte Chemie International Edition 2020, 132, 17145.