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专 业：分析化学

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简 介：曹俊涛，男，1983年7月生，博士，教授，博士生导师，河南省高层次人才（C类人才），中原千人计划—中原青年拔尖人才，河南省学术技术带头人，河南省教育厅学术技术带头人，河南省高校科技创新人才，河南省高等学校优秀共产党员、全国教育硕士优秀教学管理工作、河南省高等学校青年骨干教师，河南省优秀硕士学位论文指导教师，入选南湖学者奖励计划A类人才。

## 个人经历

### 教育经历：

2001.9-2005.6	学士	信阳师范学院	化学化工学院	化学
2005.9-2008.6	硕士	信阳师范学院	化学化工学院	应用化学
2009.9-2013.6	博士	南京大学	化学化工学院	分析化学

### 工作简历：

2013.7-2015.10	信阳师范学院化学化工学院	讲师
2015.11-2021.11	信阳师范学院化学化工学院	副教授
2021.12 -至今	信阳师范学院化学化工学院	教授

## 研究领域与兴趣

1. 微纳体系中生物分子界面行为及光电纳米传感研究
2. 便携式微器件生物传感研究

## 主讲课程

本科生：《仪器分析》、《化妆品化学》、《仪器分析实验》

研究生：《光分析化学》

## 主持科研项目

1. 国家自然科学基金（218741115）：基于空间分辨的光电化学生物传感新方法及肿瘤标志物多元分析研究
2. 国家自然科学基金（21405129）：基于微流控芯片的光电化学生物传感新方法研究
3. 中原千人计划—中原青年拔尖人才（自然科学和工程技术类）
4. 河南省高校科技创新人才支持计划项目（18HASTIT003）：光电化学纳米生物传感

5. 河南省高等学校青年骨干教师培养计划（2016GGJS-097）：光电化学灵敏检测及生化应用研究
6. 河南省高等学校重点科研项目计划（22A150022）：基于氧化还原循环信号放大策略的光电化学生物传感新方法及应用研究
7. 河南省科技厅科学发展计划项目（142300410197）：基于微纳体系的疾病分子标志物高灵敏检测新方法及应用研究
8. 河南省教育厅科技攻关项目（14A150013）：基于微芯片电泳和生物纳米探针的肿瘤标志物高灵敏检测新技术及应用
9. 南京大学“生命分析化学国家重点实验室”开放课题（SKLACLS1419）：微流体系中光电化学生物传感新方法研究
10. 山东省生化分析重点实验室开放课题（SKLBA2007）：基于空间分辨的光电化学传感新方法

## 代表性研究成果

### 期刊论文：

- 1 **Jun-Tao Cao\***, Jing-Lu Lv, Xiao-Jing Liao, Shu-Hui Ma, and Yan-Ming Liu,\* A membraneless self-powered photoelectrochemical biosensor based on Bi<sub>2</sub>S<sub>3</sub>/BiPO<sub>4</sub> heterojunction photoanode coupling with redox cycling signal amplification strategy, *Biosensors and Bioelectronics*, 2022, 195, 113651.
- 2 **Jun-Tao Cao\***, Yi-Zhuo Fu, Xiao-Long Fu, Shu-Wei Ren, and Yan-Ming Liu,\* Dual-wavelength electrochemiluminescence ratiometry for hydrogen sulfide detection based on Cd<sup>2+</sup>-doped g-C<sub>3</sub>N<sub>4</sub> nanosheets, *Analyst*, 2022, 147, 247-251.
- 3 **Jun-Tao Cao\***, Jing-Lu Lv, Xiao-Jing Liao, Shu-Hui Ma, and Yan-Ming Liu\*, Photogenerated Hole-Induced Chemical-Chemical Redox Cycling Strategy on a Direct Z-Scheme Bi<sub>2</sub>S<sub>3</sub>/Bi<sub>2</sub>MoO<sub>6</sub> Heterostructure Photoelectrode: Toward an Ultrasensitive Photoelectrochemical Immunoassay, *Analytical Chemistry*, 2021, 93(28), 9920-9926.
- 4 Jing-Lu Lv, Bing Wang, Xiao-Jing Liao, Shu-Wei Ren, **Jun-Tao Cao\***, and Yan-Ming Liu\*, Chemical-chemical redox cycling amplification strategy in a self-powered photoelectrochemical system: A proof of concept for signal amplified photocathodic immunoassay, *Chemical Communications*, 2021, 57, 1883-1886.
- 5 Li-Zhen Zhao, Yi-Zhuo Fu, Shu-Wei Ren, **Jun-Tao Cao\***, Yan-Ming Liu,\* A novel chemiluminescence imaging immunosensor for prostate specific antigen detection based on a multiple signal amplification strategy, *Biosensors and Bioelectronics*, 2021, 171, 12729.
- 6 **Jun-Tao Cao\***, Li-Zhen Zhao, Yi-Zhuo Fu, Xiang-Mei Liu, Shu-Wei Ren, and Yan-Ming Liu\*, Tyramide signal amplification and enzyme biocatalytic precipitation on closed bipolar electrode: Toward highly sensitive electrochemiluminescence immunoassay, *Sensors and Actuators B: Chemical*, 2021, 331, 129427
- 7 Yi-Zhuo Fu, Xiang-Mei Liu, Shu-Hui Ma, **Jun-Tao Cao\***, and Yan-Ming Liu\*, Liposome-assisted

- enzyme catalysis: toward signal amplification for sensitive split-type electrochemiluminescence immunoassay, *Analyst*, 2021, 146, 3918-3923.
- 8 Xiao-Jing Liao, Hui-Jin Xiao, **Jun-Tao Cao\***, Shu-Wei Ren, and Yan-Ming Liu,\* A novel split-type photoelectrochemical immunosensor based on chemical redox cycling amplification for sensitive detection of cardiac troponin I, *Talanta*, 2021, 233, 122564
  - 9 **Jun-Tao Cao\***, Yan Ma, Jing-Lu Lv, Shu-Wei Ren, and Yan-Ming Liu,\* A potentiometric resolved photoelectrochemical system based on CdS nanowires and SnNb<sub>2</sub>O<sub>6</sub> nanosheets: A case application for dual biomarkers analysis, *Chemical Communications*, 2020, 56,1513-1516.
  - 10 **Jun-Tao Cao\***, Xiao-Long Fu, Li-Zhen Zhao, Shu-Hui Ma, and Yan-Ming Liu\*, Highly efficient resonance energy transfer in g-C<sub>3</sub>N<sub>4</sub>-Ag nanostructure: Proof-of-concept toward sensitive split-type electrochemiluminescence immunoassay, *Sensors and Actuators B: Chemical*, 2020, 311, 127926.
  - 11 **Jun-Tao Cao\***, Yu-Xiang Dong, Yan Ma, Bing Wang, Shu-Hui Ma, and Yan-Ming Liu\*, A ternary CdS@Au-g-C<sub>3</sub>N<sub>4</sub> heterojunction-based photoelectrochemical immunosensor for prostate specific antigen detection using graphene oxide-CuS as tags for signal amplification, *Analytica Chimica Acta*, 2020, 1106,183-190.
  - 12 **Jun-Tao Cao\***, Xiao-Long Fu, Fu-Rao Liu, Shu-Wei Ren, and Yan-Ming Liu, Reduced graphene oxide-gold nanoparticles-catalase-based dual signal amplification strategy in spatial-resolved ratiometric electrochemiluminescence immunoassay, *Analyst*, 2020, 145, 91-96.
  - 13 Bing Wang, **Jun-Tao Cao\***, and Yan-Ming Liu\*, Recent progress of heterostructure-based photoelectrode in photoelectrochemical biosensing: A mini review, *Analyst*, 2020, 145, 1121-1128.
  - 14 Yan Ma, Yu-Xiang Dong, Bing Wang, Shu-Wei Ren, **Jun-Tao Cao\***, Yan-Ming Liu,\* CdS:Mn-sensitized 2D/2D heterostructured g-C<sub>3</sub>N<sub>4</sub>-MoS<sub>2</sub> with excellent photoelectrochemical performance for ultrasensitive immunosensing platform, *Talanta*, 2020, 207, 120288.
  - 15 Bing Wang, Yi-Tong Xu, Jing-Lu Lv, Tie-Ying Xue, Shu-Wei Ren, **Jun-Tao Cao\***, Yan-Ming Liu, and Wei-Wei Zhao,\* Ru(NH<sub>3</sub>)<sub>6</sub><sup>3+</sup>/Ru(NH<sub>3</sub>)<sub>6</sub><sup>2+</sup>-Mediated Redox Cycling: Toward Enhanced Triple Signal Amplification for Photoelectrochemical Immunoassay, *Analytical Chemistry*, 2019, 91, 3768-3772.
  - 16 **Jun-Tao Cao\***, Fu-Rao Liu, Xiao-Long Fu, Jin-Xin Ma, Shu-Wei Ren, and Yan-Ming Liu\*, A novel electrochemiluminescence resonance energy transfer system for simultaneous determination of two acute myocardial infarction markers using versatile gold nanorods as energy acceptors, *Chemical Communications*, 2019, 55, 2829-2832.
  - 17 Xiao-Long Fu, Fang Hou, Fu-Rao Liu, Shu-Wei Ren, **Jun-Tao Cao\***, and Yan-Ming Liu,\* Electrochemiluminescence energy resonance transfer in 2D/2D heterostructured g-C<sub>3</sub>N<sub>4</sub>/MnO<sub>2</sub> for glutathione detection, *Biosensors and Bioelectronics*, 2019, 129, 72-78.
  - 18 Bing Wang, Li-Ping Mei, Yan Ma, Yi-Tong Xu, Shu-Wei Ren, **Jun-Tao Cao\***, Yan-Ming Liu, and Wei-Wei Zhao\*, Photoelectrochemical-chemical-chemical redox cycling for advanced signal

- amplification: Proof-of-concept toward ultrasensitive photoelectrochemical bioanalysis, *Analytical Chemistry*, 2018, 90, 12347-12351.
- 19 **Jun-Tao Cao\***, Yu-Ling Wang, Jing-Jing Zhang, Yu-Xiang Dong, Fu-Rao Liu, Shu-Wei Ren, and Yan-Ming Liu\*, Immuno-electrochemiluminescent imaging of a single cell based on functional nanoprobes of heterogeneous Ru(bpy)<sub>3</sub><sup>2+</sup>@SiO<sub>2</sub>/Au nanoparticles, *Analytical Chemistry*, 2018, 90(17), 10334-10339.
  - 20 Bing Wang, **Jun-Tao Cao\***, Yu-Xiang Dong, Fu-Rao Liu, Xiao-Long Fu, Shu-Wei Ren, Shu-Hui Ma, Yan-Ming Liu\*, In situ electron donor consumption strategy for photoelectrochemical biosensing of protein based on ternary Bi<sub>2</sub>S<sub>3</sub>/Ag<sub>2</sub>S/TiO<sub>2</sub> NTs arrays, *Chemical Communications*, 2018, 54, 806-809.
  - 21 **Jun-Tao Cao\***, Bing Wang, Yu-Xiang Dong, Qian Wang, Shu-Wei Ren, Yan-Ming Liu\*, Wei-Wei Zhao\*, Photogenerated hole-Induced chemical redox cycling on Bi<sub>2</sub>S<sub>3</sub>/Bi<sub>2</sub>Sn<sub>2</sub>O<sub>7</sub> heterojunction: Toward general amplified split-type photoelectrochemical immunoassay, *ACS Sensors*, 2018, 3, 1087-1092.
  - 22 Yu-Xiang Dong, **Jun-Tao Cao\***, Bing Wang, Shu-Hui Ma, and Yan-Ming Liu\*, Spatial-resolved photoelectrochemical biosensing array based on CdS@g-C<sub>3</sub>N<sub>4</sub> heterojunction: A universal immunosensing platform for accurate detection, *ACS Applied Materials and Interfaces*, 2018, 10, 3723-3731.
  - 23 **Jun-Tao Cao\***, Jiu-Jun Yang, Li-Zhen Zhao, Yu-Ling Wang, Hui Wang, Yan-Ming Liu\*, Shu-Hui Ma, Graphene oxide@gold nanorods-based multiple-assisted electrochemiluminescence signal amplification strategy for sensitive detection of prostate specific antigen, *Biosensors and Bioelectronics*, 2018, 99, 92-98.
  - 24 Yu-Ling Wang, Fu-Rao Liu, **Jun-Tao Cao\***, Shu-Wei Ren, Yan-Ming Liu\*, Spatial-resolved dual-signal-output electrochemiluminescent ratiometric strategy for accurate and sensitive immunoassay, *Biosensors and Bioelectronics*, 2018, 102, 525-530.
  - 25 Fu-Rao Liu, **Jun-Tao Cao\***, Yu-Ling Wang, Xiao-Long Fu, Shu-Wei Ren, Yan-Ming Liu\*, A spatial-resolved electrochemiluminescence aptasensor for carcinoembryonic antigen detection in a double-check mode, *Sensors and Actuators B: Chemical*, 2018, 276, 173-179.
  - 26 Bing Wang, Yu-Xiang Dong, Yu-Ling Wang, **Jun-Tao Cao\***, Shu-Hui Ma, Yan-Ming Liu\*, Quenching effect of exciton energy transfer from CdS:Mn to Au nanoparticles: A highly efficient photoelectrochemical strategy for microRNA-21 detection. *Sensors and Actuators B: Chemical*, 2018, 254, 159-165.
  - 27 **Jun-Tao Cao\***, Fu-Rao Liu, Fang Hou, Juan Peng,\* Shu-Wei Ren and Yan-Ming Liu \*, Cathodic electrochemiluminescence behaviour of MoS<sub>2</sub> quantum dots and its biosensing of microRNA-21, *Analyst*, 2018, 143, 3702-3707.
  - 28 Yu-Xiang Dong, **Jun-Tao Cao\***, Bing Wang, Shu-Hui Ma, and Yan-Ming Liu\*, Exciton-plasmon interactions between CdS@g-C<sub>3</sub>N<sub>4</sub> heterojunction and Au@Ag nanoparticles coupled with DNAase-triggered signal amplification: toward highly sensitive photoelectrochemical bioanalysis

- of microRNA, *ACS Sustainable Chemistry & Engineering*, 2017, 5(11), 10840-10848.
- 29 Yu-Xiang Dong, **Jun-Tao Cao\***, Yan-Ming Liu\*, Shu-Hui Ma, A novel immunosensing platform for highly sensitive prostate specific antigen detection based on dual-quenching of photocurrent from CdSe sensitized TiO<sub>2</sub> electrode by gold nanoparticles decorated polydopamine nanospheres, *Biosensors and Bioelectronics*, 2017, 91, 246–252.
- 30 **Jun-Tao Cao**, Peng-Hui Zhang, Yan-Ming Liu, E. S. Abdel-Halim, and Jun-Jie Zhu. Versatile Microfluidic Platform for the Assessment of Sialic Acid Expression on Cancer Cells using Quantum Dots with Phenylboronic Acid Tags. *ACS Applied Materials & Interfaces*, 2015, 7 (27) :14878-14884
- 31 **Jun-Tao Cao**, Ying-Di Zhu, Rohit Kumar Rana, Jun-Jie Zhu\*. Microfluidic chip integrated with flexible PDMS-based electrochemical cytosensor for dynamic analysis of drug-induced apoptosis on Hela cells, *Biosensors and Bioelectronics*, 2014, 51, 97-102.
- 32 **Jun-Tao Cao**, Xiao-Yao Hao, Ying-Di Zhu, Ken Sun, Jun-Jie Zhu\*. Microfluidic platform for the evaluation of multi-Glycan expressions on living cells using electrochemical impedance spectroscopy and optical microscope, *Analytical Chemistry*, 2012, 84, 6775-6782.
- 33 **Jun-Tao Cao**, Zi-Xuan Chen, Xiao-Yao Hao, Peng-Hui Zhang, Jun-Jie Zhu\*. Quantum dots-based immunofluorescent microfluidic chip for the analysis of glycan expression at single cells, *Analytical Chemistry*, 2012, 84(22): 10097-10104.

#### 专利著作:

1. 国家发明专利 (ZL201910743885.7) : **曹俊涛**, 刘洋, 马燕, 刘彦明, 一种用于同时检测双心肌标志物的光电化学生物传感器的制备方法, 2021.11.30
2. 国家发明专利 (ZL 2013 1 0060501.4) : 朱俊杰, **曹俊涛**, 冉那 (Rohit Kumar Rana), 一种集成软弹性细胞电化学传感器的微流控芯片及其制法和在细胞动态分析中的应用, 2015.01.07
3. 国家实用新型专利 (ZL201620683733.4) : **曹俊涛**, 王辉, 刘彦明, 曾萍, 一种流动注射发光检测装置, 2016.11.30
4. 撰写 Wiley 出版社出版《Microfluidics: Fundamentals, Devices, and Applications》一书中“Microfluidics for disease diagnosis”专章一章。
5. 参编科学出版社出版《纳米分析化学》、《生物医用纳米材料对细胞的作用》两部专著。

#### 奖励及荣誉

河南省高层次人才 C 类人才 (拔尖人才)、“中原千人计划”—中原青年拔尖人才、河南省学术技术带头人、河南省教育厅学术技术带头人、河南省高校科技创新人才、河南省优秀硕士学位论文指导教师、河南省高等学校优秀共产党员、全国教育硕士优秀教学管理工作、河南省高校青年骨干教师、信阳市青年科技专家、校十佳导师、校优秀教师等荣誉称号。主持国家自然科学基金 2 项 (青年 1 项, 面上 1 项)、中原千人计划—中原青年拔尖人才项目、省高校科技创

新人才支持计划项目、省科技计划项目、省高校青年骨干教师支持计划、省高等学校重点科研项目等多项。2016年入选学校首批“南湖学者”资助计划A类青年项目。在 *Anal. Chem.*、*Chem. Commun.*等期刊共发表SCI论文80篇，获省优秀硕士学位论文指导教师奖、省优秀学术论文一等奖、信阳市青年科技奖等多项。已授权发明专利和实用新型专利3项。独立撰写由Wiley出版社出版《*Microfluidics: Fundamentals, Devices, and Applications*》一书中“Microfluidics for disease diagnosis”一章，参编科学出版社出版专著两部。

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