

Yunrui Yan

Phone: +1 2817771529 | Email: yy92@rice.edu | 2900 N Braeswood Blvd, Houston, TX 77025

Education

Rice University, M.E., US

Aug 2021 – Expected May 2023

Major: Master of Materials Science And NanoEngineering | **GPA: 4.00**

Courses: *MechProperties of Materials (A), Thermodynamics in Materials Science (A), Materials science foundation (A+), Physical Chemistry (B+), Material Chemistry (B), Thin Film Materials and preparation (A)*

Shanghai Polytechnic University, B.E., China

Sept 2017 - Jul 2021

Major: Materials Chemistry | **GPA: 84.1 (3.41/4)**

Thesis: Study of Thermal Conductivity of Fluorinated Graphene

Courses: *Fundamentals of Materials Science (97), Physicochemical (87), Semiconductor Materials, Processes and Devices (87), Micro and Nano Materials and Technologies (90), Nanobionics (89), Thin film materials and preparation technology (94)*

Publication

- ♦ **Yan, Y.**, Resonance frequency and stability of composite micro/nanoshell via deep neural network trained by adaptive momentum-based approach. *Geomechanics and Engineering*, vol. 28, Number 5, 2022, pages 477-491.
<https://doi.org/10.12989/gae.2022.28.5.477>
- ♦ **Yan, Y.**, & Wei, Z. (2022). Ca₂C MXene monolayer as a superior material for detection of toxic pnictogen hydrides. *Materials Chemistry and Physics*, 281, 125869. <https://doi.org/10.1016/j.matchemphys.2022.125869>
- ♦ **Yunrui, Y.**, 'Study of Thermal Conductivity of Fluorinated Graphene', International Conference on Manufacturing Technology and New Materials, 2022 (Accepted)
- ♦ **Yunrui, Y.**, 'Exfoliation of Hexagonal Boron Nitride Nanosheets Assisted with Covalent Organic Frameworks by Ball-Milling', International Conference on Manufacturing Technology and Applied Materials, 2022 (Accepted).
- ♦ Debing, W, Wenwen, L, Zhiheng, Z, Peiyu, J, **Yunrui, Y**, Huaqing, X, Lingling, W, & Wei, Y 2021, 'Highly Efficient Energy Harvest Via External Rotating Magnetic Field for Oil Based Nanofluid Direct Absorption Solar Collector', *Green Energy & Environment* 6, vol. 2, pp. 298-307.

Research Experience

Exfoliation Of Hexagonal Boron Nitride Assisted with Covalent Organic Frameworks by Ball-Milling

Rice University Houston

Aug 2021 – Dec 2021

Graduate Researcher

- ♦ Used COFs material as a ball milling aid to exfoliate boron nitride to obtain boron nitride nanosheets, and through a series of characterization tests
- ♦ Chose COFs and other solid ball milling aids to ball mill hbn separately, tested the lateral size, thickness, and aspect ratio of hbn; then analyzed influencing factors of the three aspects of hbn mentioned above, and checked the results through machine learning to make predictions
- ♦ Demonstrated that the COF selected in this experiment is not suitable for auxiliary ball milling, but through this study, the factors affecting the quality of hbn nanosheets have been obtained

Performance Study of Flexible Polymer Substrates with Ordered Arrangement of hbn

Aug 2021 – Dec 2021

- ♦ Conducted literature research to find a method for testing the water permeability of flexible polymer substrates
- ♦ Practiced to use the glove box and assemble the test setup while ball milling the polymer and adding different amounts of h-BN

Resonance And Stability of Composite Micro/Nanoshell Via Deep Neural Network Trained by Adaptive Momentum-Based Approach,

Kunming Institute of Precious Metals

Feb 2021 – Aug 2021

and May 2018 - Sept 2018

- ♦ Literature research on the study of resonance and stability of composite micro/nanoshells, while learning to use adaptive momentum methods for their study.
- ♦ Familiarity with the use of adaptive coordinated deep neural networks (DNNs) and selection of graphene nanosheets for their dynamic stabilization analysis.
- ♦ Investigated the thermal buckling and resonance frequencies of graphene nanosheet-reinforced composites under different thermal loads, and analyzed the various experimental data.

Study of Thermal Conductivity of Fluorinated Graphene
Shanghai Polytechnic University

Aug 2020 – Apr 2021

Bachelor Thesis

- ◆ A highly compressible, thermally conductive, and electrically insulating fluorinated graphene was developed by hydrothermal method assisted by hydrofluoric acid, and the effect on the thermal conductivity of fluorinated graphene was investigated by varying the fluorine-to-carbon ratio (F/C) via adjusting the hydrofluoric acid content.
- ◆ The prepared fluorinated graphene has good insulating properties with a minimum conductivity of $4 \times 10^{-7} \text{ S cm}^{-1}$ and a thermal conductivity of $1.254 \text{ W m}^{-1} \text{ K}^{-1}$. Meanwhile, because of the porous structure of graphene fluoride, we prepared epoxy resin/fluorinated graphene nanocomposites by vacuum-assisted infiltration process with epoxy resin as the filler material. This material and fluorinated graphene showed outstanding thermal performance during typical cooling process.

Ca₂C Mxene Monolayer as A Superior Material for Detection of Toxic Pnictogen Hydrides

Peking University

Feb 2020 – Jan 2021

- ◆ Proposed the idea of exploring the application of Ca₂C MXene monolayer as a gas sensor to detect toxic PH through literature research and shadowing researcher.
- ◆ Designed work program, investigated the performance of Ca₂C MXene layers to detect toxic NH₃, PH₃, AsH₃ and SbH₃ using density functional theory (DFT) calculations.
- ◆ Analyzed the results of the calculations and indicated that Ca₂C MXene could be a suitable adsorbent for the detection of harmful PH gas molecules

Highly Efficient Energy Harvest Via External Rotating Magnetic Field for Oil Based Nanofluid Direct Absorption Solar Collector

Shanghai Polytechnic University

Aug 2019 – Jun 2020

Project Team Member

- ◆ Proposed a new method of using magnetic nanofluids in DASCs, which can obtain high-quality energy and avoid the problems of blockage and corrosion in the heat exchanger
- ◆ Proposed using magnetic nanofluids based on Fe₃O₄@C-oil nanofluids as the working fluids of DASCs. The maximum temperature of DASCs can reach 98 °C by adding Fe₃O₄@C magnetic nanoparticles into pure oil under three solar irradiations. The photothermal conversion efficiency is increased from 42.2% to 60.9% with the increasing concentration of nanofluids from 0 to 500 ppm
- ◆ Designed a forced convective nanofluids absorption system to further improve the photothermal conversion efficiency of DASCs by adding an external rotating magnetic field
- ◆ Indicated the method reduces the flow resistance in the pipeline and avoids problems such as blockage and corrosion in the heat exchangers

Preparation of In₂O₃/Co₃O₄ Composite Material Based on IN-MOF Material and Research on Its Gas Sensitivity

Shanghai Polytechnic University

Jan 2019 – Jul 2020

National College Students' Innovation and Entrepreneurship Training Program

- ◆ Prepared indium-based MOF material and studied its gas sensitivity to hydrogen sulfide, acetone and other gases
- ◆ Prepared precursor CPP-3, doped with cobalt, calcined, prepared gas sensor for gas sensitivity test
- ◆ In₂O₃/Co₃O₄ was successfully made into a gas sensing material, which was derived from a CPP-3 (In) template impregnated with cobalt ions

Working & Intern Experience

Kunming Institute of Precious Metals, China
and May 2018 - Sept 2018

Feb 2021 – Aug 2021

Assistant Researcher

- ◆ Participated in the hydrogen sensor electrode preparation project, checked whether the electrode meets the specifications
- ◆ Responsible for collecting and recording data, conducting analyses of datasets
- ◆ Literature research on the study of resonance and stability of composite micro/nanoshells, while learning to use adaptive momentum methods for their study.
- ◆ Familiarity with the use of adaptive coordinated deep neural networks (DNNs) and selection of graphene nanosheets for their dynamic stabilization analysis.
- ◆ Investigated the thermal buckling and resonance frequencies of graphene nanosheet-reinforced composites under different thermal loads, and analyzed the various experimental data.

Extracurricular Activities

- ◆ **Research Assistant** **Feb 2021 – Aug 2021**
and May 2018 - Sept 2018
Department of Advanced Material, **Kunming Institute of Precious Metals**, advised by Prof. Ming Wen

- ◆ **Research Assistant** **Feb 2020 – Jan 2021**
College of Chemistry and Molecular Engineering, **Peking University**, advised by Dr. Wei Wang

- ◆ **Research Assistant** **Mar 2019 – Oct 2019**
School of Energy and material, **Shanghai Polytechnic University**, advised by Prof. Wei Yu

- ◆ **Research Assistant** **Sept 2018 – Feb 2019**
School of Energy and material, **Shanghai Polytechnic University**, advised by Prof. Lili Xie

Honors & Awards

- ◆ Third Price of Shanghai University Students Innovation Competition, Oct 2019
- ◆ Merit Student (top10%), Shanghai Polytechnic University, 2018-2019
- ◆ Outstanding Student Scholarship (top10%), Shanghai Polytechnic University, 2018-2019
- ◆ Second-class Scholarship, Shanghai Polytechnic University, 2017-2018

Skills

- ◆ **Language:** English (Full professional proficiency), Mandarin (native)
- ◆ **Computer:** PS, MS Office, Material studio, Python, MATLAB, VASP, Gaussian, 3D MAX