Bowen Gong

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Research interests

Network Science, Social Network, Machine Learning, Natural Language Processing, Parallel Computing, Finite Element Analysis

Education

2016 – 2022 **Rensselaer Polytechnic Institute** – Troy, NY
Ph.D. in Mechanical Engineering
Advisor: Dr. Jie Lian | GPA: **4.0** / 4.0

2019 – 2021 **Rensselaer Polytechnic Institute** – Troy, NY
M.S. in Computer Science
Advisor: Dr. Boleslaw Szymanski | GPA: **4.0** / 4.0

2017 – 2021 **Georgia Institute of Technology** – Atlanta, GA
M.S. in Computer Science
Specification: Computing System | GPA: **4.0** / 4.0

2014 – 2015 **Arizona State University** – Tempe, AZ
M.S. in Mechanical Engineering
GPA: **4.0** / 4.0

2010 – 2014 **Huazhong Univ. of Sci. and Tech.** – Wuhan, China
B.S. in Mechanical Engineering
Awards: Magna Cum Laude, Best Thesis of Hubei Province (top 1‰)

Work Experience

2015 – 2016 **Oak Ridge National Laboratory** – Oak Ridge, TN
Research Assistant | Advisor: Dr. Zhili Feng

• Utilized finite element analysis to optimize the shape and dimension of the high-pressure hydrogen vessel using ABAQUS to reduce cost and mitigate stress concentration

• Created finite element models to validate welding experiments, estimate temperature and stress distribution, and provide sound predictions for the future experiments

Research experience

2020 – 2021 **Characterizing Topics in Social Media Using Dynamics of Conversation**
Advisor: Dr. Boleslaw Szymanski (RPI)

• Extracted key response features that depict the dynamics of the conversation under different subreddits by analyzing a Reddit dataset containing 5K subreddits and 887M comments

• Utilized machine learning to evaluate the effectiveness of the extracted response features, which show a 90% accuracy in predicting the genre of Reddit submissions

• Clustered posts within a subreddit with response features, K-means, and PCA to identify the dominant topics within each subreddit

• Applied the derived response features to accurately detect outlier posts and efficiently predict the viral posts

2019 – 2021 **Modelling Epidemic Spread in Cities Using Public Transportation as a Proxy for Generalized Mobility Trends**
Advisor: Dr. Boleslaw Szymanski (RPI)

• Developed a data-driven epidemiological model to assess the impact of human mobility on the spread of COVID-19

• Calibrated the epidemic model with census and mobility data involving subway transit

• Estimated the governing epidemic parameters that enable predictions of spread under different diffusion prevention strategies

• Evaluated the impact of various policies, such as the mask mandates and lockdown to the pandemic spread

• Predicted accurately the daily cases in NYC with the developed model and the mobility data

2019 – 2020 **High Performance Parallel Computing for PDE Solver**
Advisor: Dr. Christopher Carothers (RPI)

• Designed and developed a efficient parallel algorithm with CUDA and MPI to solve PDE equations. The computation cost reduced by 60% comparing to the serial algorithm • Evaluated the performance of the implemented algorithms based on the weak scaling and strong scaling study • Implemented the parallel I/O to allow massive concurrent read/write operations to a common file

2016 – Present **The Development of Accident Tolerant Nuclear Fuels**
Advisor: Dr. Jie Lian (RPI)

• Passionately working on improving mechanical and thermal performance of accident tolerant fuel (ATF) for LWR. Actively exploring safer and reliable fuel forms with higher uranium density and enhanced oxidation resistance.

• Synthesized UO_2 pellets with spark plasma sintering (SPS) and studied the grain size effect on its mechanical properties at elevated temperatures with nano- and micro-indentation testing.

• Manufactured commercial-size UO_2 with SPS. Conducted microstructure and micro-chemical analysis to examine the uniformity of its density, grain size, and stoichiometry, demonstrating the potential of SPS to fabricate nuclear fuels cost-effectively.

• Analyzed additive impact on the thermal conductivity, mechanical property, and oxidation resistance of U_3Si_2. The additives include Cr, BeO, Al, and UO_2.

• Derived oxidation activation energy of microcrystalline and nanocrystalline U_3Si_2 via kinetic analysis and isothermal TGA testing.

• Assessed the stability of Cr doped and Cr+Al doped U_3Si_2 in H_2O containing atmospheres with ramping/isothermal steam testing and evaluated the degradation mechanism of U_3Si_2 in H_2O.

• Studied thermal-induced and irradiation-induced grain growth of U_3Si_2 and derived the corresponding activation energies.

• Investigated irradiation-induced amorphization and subdivision of U_3Si_2, along with the analysis of bubble formation and growth under the bombardment of Xe and Kr.

• Generated machine learning and regression models to examine the factors that govern the leaching behavior of pyrochlore, which can be used to predict and validate leaching experiment results.

• Familiar with characterization tools, such as SEM, TEM, and XRD. Frequently employed focused ion beam (FIB) to manufacture TEM samples.

Teaching experience

Spring 2022 **Teaching Assistant**, RPI
Numerical Methods and Programming for Engineers

Fall 2021 **Teaching Assistant**, RPI
Numerical Methods and Programming for Engineers

Spring 2021 **Teaching Assistant**, RPI
Numerical Methods and Programming for Engineers

Fall 2020 **Teaching Assistant**, RPI
Numerical Methods and Programming for Engineers

Spring 2020 **Teaching Assistant**, RPI
Numerical Methods and Programming for Engineers

Spring 2018 **Teaching Assistant**, RPI
Thermal fluid

Fall 2016 **Teaching Assistant**, RPI
Thermal fluid

Publications

2022 [J30] **Modelling epidemic spread in cities using public transportation as a proxy for generalized mobility trends**
Malik, O., Gong, B., Moussawi, A., Korniss, G., Szymanski, BK.
Scientific Reports, under review

[J29] **A kinetic study of the oxidation of SPS-sintered U_3Si_2**
Gong, B., Zhao, D., Broussard, A., Harp, J., Nelson, A., Lian, J.
Journal of Applied Physics, under review

[J28] **High-temperature compressive creep tests of U_3Si_2 with spark plasma sintering: Experiments and Finite Element Modeling**
Gong, B., Zhao, D., Broussard, A., Harp, J., Nelson, A., Lian, J.
Journal of Nuclear Materials

2021 [J27] **Characterizing topics in social media using dynamics of conversation**
Flamino, J., Gong, B., Buchanan, F., Szymanski BK.
Entropy

[J26] **UN and U_3Si_2 composites densified by spark plasma sintering for accident-tolerant fuels**
Gong, B., Kardoulaki, E., Yang, K., Broussard, A., Zhao, D., Metzger, K., White, J.T., Sivack, M.R., Mcclellan, K.J., Lahoda, E.J., Lian, J.
Ceramic International

[J25] **Cr-incorporated uranium nitride composite fuels with enhanced mechanical performance and oxidation resistance**
Yang, K., Kardoulaki, E., Zhao, D., Gong, B., Broussard, A., Metzger, K., White, J.T., Sivack, M.R., Mcclellan, K.J., Lahoda, E.J., Lian, J.
Journal of Nuclear Materials

[J24] **Micro-cantilever beam experiments and modeling in porous polycrystalline UO_2**
Gong, B., Frazer, D., Shaffer, B., Lim, H.C., Hosemann, P., Peralta, P.
Journal of Nuclear Materials

[J23] **Machine learning-enabled prediction of chemical durability of $A_2B_2O_7$ pyrochlore and fluorite**
Gong, B., Yang, K., Lian, J.A., Wang, J., 2021.
Computational Materials Science

[J22] **A systematic study of lanthanide titanates ($A_2Ti_2O_7$) chemical durability: corrosion mechanisms and control parameters**
Yang, K., Lei, P., Yao, T., Gong, B., Wang, Y., Li, M., Wang, J., Lian, J.
Corrosion Science

[J21] **Elevated temperature nanoindentation creep study of plastically deformed and spark plasma sintered UO_2**

Frazer, D., Shaffer, B., Gong, B., Peralta, P., Lian, J. and Hosemann, P.

Corrosion Science

[J20] **Aluminum-doped U_3Si_2 composite fuels with enhanced oxidation resistance**

Mohamad, A., Yao, T., Gong, B., Harp, J., Wagner, A.R., Nelson, A.T., Lian, J.

Journal of Alloys and Compounds

[J19] **Fabrication and thermophysical properties of UO_2-UB_2 and UO_2-UB_4 composites sintered via spark plasma sintering**

Kardoulaki, E., Frazer, D.M., White, J.T., Carvajal, U., Nelson, A.T., Byler, D.D., Saleh, T.A., Gong, B., Yao, T., Lian, J., McClellan, K.J.

Corrosion Science

[J18] **3Y-TZP Toughened and Oxidation-resistant U_3Si_2 Composites for Accident Tolerant Fuels**

Mohamad, A., Gong, B., Yao, T., Wagner, A.R., Benson, M.T., Lian, J.

Journal of Nuclear Materials

2020 [J17] **Cr-doped U_3Si_2 composite fuels under steam corrosion**

Gong, B., Cai, L., Lei, P., Metzger, K.E., Lahoda, E.J., Boylan, F.A., Yang, K., Fay, J., Harp, J., Lian, J.

Corrosion Science

[J16] **UO_2 + 5vol % ZrB_2 nano composite nuclear fuels with full boron retention and enhanced oxidation resistance**

Yao, T., Gong, B., Lei, P., Lu, C., Xu, P., Lahoda, E., Lian, J.

Ceramics International

[J15] **Spark plasma sintering (SPS) densified U_3Si_2 pellets: Microstructure control and enhanced mechanical and oxidation properties**

Gong, B., Yao, T., Lei, P., Harp, J., Nelson, A.T., Lian, J.

Journal of Alloys and Compounds

[J14] **U_3Si_2 and UO_2 composites densified by spark plasma sintering for accident-tolerant fuels**

Gong, B., Yao, T., Lei, P., Cai, L., Metzger, K.E., Lahoda, E.J., Boylan, F.A., Mohamad, A., Harp, J., Nelson, A.T., Lian, J.

Journal of Nuclear Materials

[J13] **Development of a grain growth model for U_3Si_2 using experimental data, phase field simulation and molecular dynamics**

Cheniour, A., Tonks, M.R., Gong, B., Yao, T., He, L., Harp, J.M., Beeler, B., Zhang, Y., Lian, J.

Journal of Nuclear Materials

[J12] **Thermophysical and mechanical property assessment of UB_2 and UB_4 sintered via spark plasma sintering**

Kardoulaki, E., White, J.T., Byler, D.D., Frazer, D.M., Shivprasad, A.P., Saleh, T.A., Gong, B., Yao, T., Lian, J., McClellan, K.J.

Journal of Alloys and Compounds

[J11] **Spark plasma sintering-densified vanadinite apatite-based chlorine waste forms with high thermal stability and chlorine confinement**

Lei, P., Yao, T., Gong, B., Zhu, W., Ran, G., Lian, J.

Journal of Nuclear Materials

2019 [J10] **Nano-and micro-indentation testing of sintered UO_2 fuel pellets with controlled microstructure and stoichiometry**

Gong, B., Frazer, D., Yao, T., Hosemann, P., Tonks, M. and Lian, J.

Journal of Nuclear Materials

[J9] **In situ investigation of Water interaction with Lead-Free all inorganic perovskite ($Cs_2SnI_xCl_{6-x}$)**

Zhu, W., Yao, T., Shen, J., Xu, W., Gong, B., Wang, Y., Lian, J.

The Journal of Physical Chemistry C

[J8] **Deciphering the degradation mechanism of the lead-free all inorganic perovskite Cs_2SnI_6**

Zhu, W., Xin, G., Scott, S.M., Xu, W., Yao, T., Gong, B., Wang, Y., Li, M., Lian, J.

npj Materials Degradation

2018 [J7] **In-situ TEM study of the ion irradiation behavior of U_3Si_2 and U_3Si_5**

Yao, T., Gong, B., He, L., Miao, Y., Harp, J.M., Tonks, M., Lian, J.

Journal of Nuclear Materials

[J6] **Consolidation of commercial-size UO_2 fuel pellets using spark plasma sintering and microstructure/microchemical analysis**

Gong, B., Yao, T., Lu, C., Xu, P., Lahoda, E., Lian, J.

MRS Communications

[J5] **Radiation-induced amorphization of Langasite $La_3Ga_5SiO_{14}$**

Yao, T., Lu, F., Zhang, H., Gong, B., Ji, W., Zuo, L., Lian, J.

Journal of Nuclear Materials

[J4] **Dense nanocrystalline UO_{2+x} fuel pellets synthesized by high pressure spark plasma sintering**

Yao, T., Scott, S.M., Xin, G., Gong, B., Lian, J.

Journal of the American Ceramic Society

[J3] **Thermally-conductive and mechanically-Robust graphene nanoplatelet reinforced UO2 composite nuclear fuels**

Yao, T., Xin, G., Scott, S.M., Gong, B., Lian, J.

Scientific reports

[J2] **Radiation-induced grain subdivision and bubble formation in U_3Si_2 at LWR temperature**
Yao, T., Gong, B., He, L., Harp, J., Tonks, M., Lian, J.
Journal of Nuclear Materials

2016 [J1] **Effects of microstructural constraints on the transport of fission products in uranium dioxide at low burnups**
Lim, H.C., Rudman, K., Krishnan, K., McDonald, R., Gong, B., Peralta, P.
Journal of Nuclear Materials

Talks

2021 **Synthesis of UN-U_3Si_2 Composite fuels by spark plasma sintering and properties characterization**
Materials in Nuclear Energy Systems (MiNES), 2021