

**PROJECT CATEGORY:** CleanTech**STARTUP:** IROC**CONTACT:** Jie Qi**WEBSITE:****EMAIL:** jie.qi@northwestern.edu**RESEARCH  
AREA:**

IROC is dedicated to addressing critical sustainability challenges by developing innovative Iron-based powder technology for cost-effective, high-efficiency hydrogen storage and CO<sub>2</sub> capture and utilization.

**PROJECT TITLE:** Scale-Up of Iron-Based Powder Technology for Hydrogen Storage and Carbon Capture**PROJECT DESCRIPTION**

By 2050, many countries, including the U.S. and European nations, are striving to achieve net-zero carbon emissions, facing two major challenges: the widespread adoption of hydrogen as a clean fuel and the capture and utilization of CO<sub>2</sub> emissions.

Over the past decade, we have developed an advanced iron-based powder capable of addressing both challenges. Compared to existing solutions, our technology offers higher efficiency, lower costs, improved environmental sustainability, and superior volumetric density. We are confident that this innovation can play a significant role in both hydrogen storage and CO<sub>2</sub> capture applications.

Commercializing this technology requires scaling up production. We are currently constructing significantly larger reactors, with a capacity increase of more than 1000 times. This project will focus on accelerating the scale-up process, ensuring the technology is ready for broader industrial deployment.

**JOB EXPECTATIONS:**

We expect to complete the construction and optimization of the large-scale reactor. Following this, we aim to gather comprehensive performance data on the reactor's effectiveness in both hydrogen storage and CO<sub>2</sub> capture, including key metrics such as reaction rates, gas purity, and overall efficiency.

**DESIRED EXPERIENCE:**

We are looking for a student with a strong problem-solving mindset, as the project involves building innovative technology that has not been explored before. The student will need to tackle various mini-tasks throughout the project, making skills such as brainstorming and researching potential solutions online essential.

A foundational background in science and engineering is important to help the student understand the reaction mechanisms and engineering design considerations involved in the process. Additionally, we hope the student enjoys hands-on activities, as the project will involve practical work and experimentation.

**TIME COMMITMENT:**

We are flexible with the project duration and would appreciate the student staying involved for as long as possible. For example, a 10-week commitment would be perfectly acceptable.

**TRAINING MENTORING:**

The student will collaborate closely with our core technology team, consisting of Ph.D.-level experts with extensive experience in developing this technology. Regular meetings and discussions will be held with the supervising team, including professors from Northwestern and experienced entrepreneurs, providing valuable mentorship throughout the project.

From a skill development perspective, the student will gain in-depth knowledge of materials science related to this technology. Additionally, they will acquire a range of hands-on skills in areas such as high-temperature system heat management, system automation, and fuel gas system design and integration. There may also be opportunities for the student to explore techno-economic analysis, offering insights into the economic feasibility of the technology and its commercialization pathway.