**Global Research Outreach\_2025\_Call for proposal**

**Theme: Next Generation Catalyst**

**- Sub-Theme: Green Catalysis and Synthesis**

In response to the escalating climate crisis and the growing urgency of sustainable development, reaching net-zero emissions and transitioning to a circular economy have become as critical global imperatives. This necessitates the advancement of environmentally responsible catalytic and synthetic approaches to replace traditional high-energy, carbon-intensive processes. Natural enzymes are highly evolved catalysts that demonstrate exceptional specificity and efficiency under mild conditions. While they offer powerful models for sustainable catalysis, replicating these properties in artificial systems is challenging due to their complex 3D structures, dynamic flexibility, and finely tuned microenvironments. Recent advances in AI-driven protein structure prediction, computational materials design, and self-assembling nanosystems are paving new ways to achieve enzyme-like functionality.

This call aims to develop next-generation catalytic platforms by integrating the molecular precision of natural catalysts such as metalloenzymes with cutting-edge materials engineering and systems design. It also promotes interdisciplinary convergence among chemical biology, materials science, electrochemistry, and microfabrication to accelerate innovative decarbonization technologies. The scope includes not only biomimetic catalysis, but also the broader development of advanced materials and systems to enable a carbon-negative future.

The topics we pursue through this GRO are as follows:

1. Metalloenzyme-Inspired Functional Materials
2. Redox Mediator and Electron Shuttling Platforms for Oxidoreductases
3. Bioelectro-Hybrid Systems for High-Value Material Synthesis
4. Advanced Sorbent Materials and Systems for Direct Air Capture

※ *The topics are not limited to the above examples and the participants are*

 *encouraged to propose the original idea.*

※ *Funding: Up to USD 150,000 per year*