

[Call for Proposal]
Korea-China Key Joint Research Program 2023

National Research Foundation of Korea(NRF), upon the agreement with National Natural Science Foundation of China(NSFC), announces the call for the “Key Joint Research Program 2023”.

July 19th, 2023

LEE Kwang Bok

President

National Research Foundation of Korea

[NOTE]

The maximum number* of Research and Development task that one researcher may perform simultaneously is inapplicable to this program.

** S&T(3 projects as PI, 5 project as Co-I) / Humanities and social science(2 project as PI, 3 project as Co-I)*

1. Program Overview

1.1. Objectives

- Produce research achievements resolving common issues of both countries through strategic joint research between Korea and China
- Enhance research outcomes by designating and supporting strategic fields

1.2. Features

- Program Category : Joint Research
 - ※ An applicant can participate in only one project whether as a Principal Investigator(PI) or as a participating researcher.
 - ※ A proposal title should be exactly identical between the chinese partners.
- Eligible Field : Specified S&T Field
- Program Summary

Program	Subject Area ('23)	Grant		Commencement	Number of New Project
		Funding(KRW/Yr)	Period		
Key Joint Research	Biomimetic metal catalysis*	60,000,000	3 years	2023.11.1.	2

※ Description of the Subject Area(attached)

<NOTES>

1. Details are subject to change based on the agreement between funding agencies.
2. The funding above is for Korean researcher applying to NRF. Partner researcher is encouraged to check respective agency's rule for the funding.
3. Funding grant includes indirect expenses(Less than 5% of direct expenses).
4. The names of partner researchers should be stated in application form(in English and Chinese).
5. ONLY jointly(simultaneously) submitted proposals are subject to evaluation. So the applicant is encouraged to check the period of submission and its results with his/her partner researcher.
6. Number of New Project is subject to change according to evaluation result.

2. Application Guidelines

2.1. Eligibility

- Researchers at universities/institutes defined in Paragraph 3 of Article 2 of the National Research and Development Innovation Act.
 - ※ Partner researcher should meet qualifications by NSFC.
- Researchers who can fulfill responsibility and roles under Article 6&7 of the National Research and Development Innovation Act.
- Researchers who are **NOT** restricted under the followings:

- ① A researcher, as of the commencement date, who is currently participating or intends to participate as PI in other NRF funded international cooperation programs*
- ※ Short-term research exchange(international symposium/seminar/airfare funding) programs are NOT included.
 ※ For the project with extended period due to COVID-19, only originally contracted period is considered
- * NRF funded International Cooperation Program**
- NRF-NSFC Joint Research, NRF-JSPS Joint Research, NRF-NSFC Key Joint Research, A3 Foresight Program, ROK-GER Cooperation Program(DFG,DAAD,AvH), NRF-NORDIC Cooperation Program, ROK-US Cooperation Program in Humanities, Research Exchange(bilateral/unilateral), NRF-IIASA Cooperation Program, NRF-CSTEC Young Researcher Exchange Program(dispatched researchers only)
- ② A researcher under restriction by Enforcement Decree of National Research and Development Act as of the last day of submission. An applicant who gets restriction after the submission must report to NRF, and the respective proposal will be excluded from evaluation.
- ③ A researcher funded by the NRF, and has not yet submitted the final report on the respective projects within due date.
- ④ A researcher who intends to submit the same research already funded by either the NRF or other funding agencies.

2.2. How to Apply

Schedule			Procedures
Open Call	Application	Deadline	
July 19	July 21	August 23 17:00 KST	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Register/update personal information on KRI*</div> <div style="text-align: center;">↓</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Apply via e-R&D system*</div> <div style="text-align: center;">↓</div> <div style="border: 1px solid black; padding: 5px;">Organization approval</div>

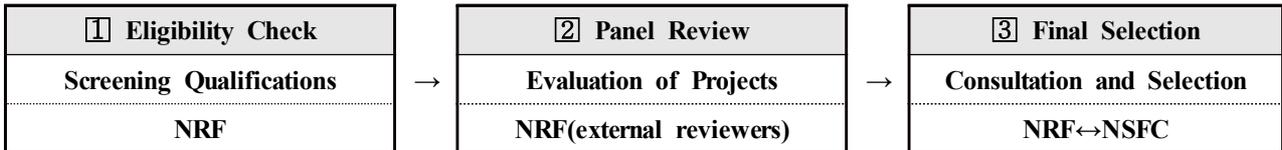
- <NOTES>**
1. PI application and organization approval should all be done within application period. Application without approval from organization is not accepted.
 2. The above schedule is for those applying to the NRF. Partner PIs are encouraged to check application schedules from NSFC.
 3. A new subscriber to the KRI site must join the IRIS(www.iris.go.kr) before joining the KRI. After that, it will need to obtain “국가연구자번호 (National researcher’s registration number)” through an NRI site that can be accessed through the IRIS.
 - ☞ Join the IRIS ⇒ Access to the NRI ⇒ Obtain the Researcher’s Number (“국가연구자번호”)
 - ⇒ Join the KRI ⇒ Register/update personal information on KRI (please refer to the manual)

2.3. Requirements ※ Forms for each requirement is enclosed

- Research Proposal
- Personal Information Collection and Use Consent Form (for only Korean side)

3. Evaluation and Selection Procedures

3.1. Evaluation Procedures



※ Each Procedure except for the final selection is conducted according to the protocols of NRF.

3.2. Criteria

Criteria	Evaluation Indicators	Score
Research Plan (45)	Appropriateness of subject area and necessity of research project - Validity, feasibility and innovation of research objectives	25
	Fidelity of plans and adequacy of implementation system - Previously conducted exchange activities, and basis for cooperation - Validity and concreteness of exchange(technical/personnel) plans - Distribution of workload between partners, and validity of plans	10
	Budget allocation adequacy	10
	Research Capability (30)	Capability and research performance of a Principal Investigator Capability and research performance of a partner researcher/institute
Research Impact (25)	Expected effects of research result and utilization plans - Contribution to globalization(establishment of network, strengthening cooperation, etc.)	10
	Possibility of further development to domestic/international cooperation - Possibility of improving the research performance of domestic researchers and gaining international credentials.	15
Total		100

3.3 Selection

- Selection is finalized through consultation between funding agencies(NRF-NSFC).
- Agencies may not select any projects if they are under-qualified for funding.

4. Project Management

4.1. Reports ※ Forms and other details(how to submit, lengths etc.) will be provided by the NRF.

- Mid-term report and final report : Must be submitted to the NRF until the date NRF will announce.
- ※ Mid-term and final evaluation shall be implemented according to *[Management Guideline for International Cooperation Program]*.

4.2. Management of Research Fund

- Provision : The NRF provides contracted fund to a lead institute after concluding contract.
- Management A lead institute is responsible for management of research funds.
- Use of Fund : Fund should be used according to the proposal for contract and [*Management Guideline for International Cooperation Program*].
 - ※ Must use Research Credit Card and be managed through Ezbaro System(<https://www.ezbaro.go.kr>)
- Financial Report
 - Fund statement shall be entered on Ezbaro system before the end of the annual research period.
 - The financial report shall be submitted via Ezbaro system within three months after the end of the research.
 - ※ For multi-year contract, balance may be carried in the same category.

4.3. Research Outcome and Acknowledgement

- A lead institute(or PI) should register/upload research outcomes to NRF e-R&D system for five years after the end of the project. The NRF may request a lead institute(or PI) to submit research outcome in hard copy.
- In any research outcome(thesis, journal, etc.) acknowledgement should be stipulated.

< Acknowledgement >

- (KOR) 이 논문(저서)은 2023년도 대한민국 정부(과학기술정보통신부)와 한국연구재단의 지원을 받아 연구되었음(과제번호)
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※ Project Number can be checked in e-R&D.

- Other details shall conform to the [*Management Guideline for International Cooperation Program*].

5. Schedules

Application		Eligibility Check & Exchange the List	Evaluation & Selection	Announcement	Commencement
Start	End				
July 21, 2023	August 23 17:00 KST	August, 2023	From September to October	October, 2023	November 1 st 2023

※ Schedules may change upon the agreement between funding agencies.

6. Contact Point

Agency	Name	Contact		Remarks
NRF	CHO Eunhye (Ms.)	Email	grace292@nrf.re.kr	-
		Phone	+82-(0)2-3460-5682	
NSFC	RONG Nianhe (Mr.)	Email	rongnh@nsfc.gov.cn	-
		Phone	+86-10-6232-6998	

Biomimetic metal catalysis

During the course of evolution, nature creates molecular systems to adapt specific functions toward efficiency and selectivity as required for the operation of life. Deciphering the codes of such molecular systems, constructing new models, and implementing them on the wider scene is challenging for chemists. Among them, the active sites of metalloenzymes have been unique sources of inspiration for synthetic chemists, whereby recent developments significantly impact the fields of synthesis, catalysis, biomedicine, and energy. This program calls for fundamental research toward biomimetic metal complexes that have the potential to significantly impact areas of science well beyond the subdiscipline of chemistry from which it originated. In more general terms, this scientific research is required to concern the mechanisms of metal intermediates with different spin states, rendering the advanced quantum science and techniques involving understanding electron spin, a fundamental property of Nature, on the reactive pathways. This program includes the following topics:

1. Biomimetic Transition Metal Models for Small Molecule Activation. The metabolism of O_2 , CO_2 , N_2 , etc. is the central issue in a variety of biological and chemical processes, including renewable energy and redox homeostasis. Nature mainly uses 3d transition metals such as iron, cobalt, and manganese for these transformations due to their availability, appropriate binding of small molecules, and rich redox chemistry. This program encourages in-depth studies of M-nitrogen (N) or carbon (C) systems and, from there, extend to similar systems with transition metals coordination chemistry and the related reactions.
2. The metal-X (X= O, N, and C) reaction mechanism intermediates. Metal-X complexes are implicated as active intermediates in alkane hydroxylation, olefin epoxidation, her oxidation, nitrogenation, etc. For example, high-valent metal-oxo complexes often act as the critical reactive intermediates in many O-O bond formation and cleavage reactions. Spin densities and multiplicity played a critical role in the O-O bond coupling and O transfer. This program encourages the detailed experimental and theoretical mechanistic studies by the unambiguous assignment of the spin states or different means to manipulate the spin state, and understanding the relationship between the structure and reactivity of manganese, iron, cobalt, nickel, and copper model complexes.

3. Application scenario: Renewable energy, biomedicine, etc. The efforts has included the development of ways in which biomimetic metal molecules can be tailored through chemical synthesis, as well as understanding how molecules convert absorbed energy into chemical energy on time scales faster than a millionth of a second or stimulated by electricity. On the other hand, biomimetic model complexes as prodrugs have emerged to maintain the redox homeostasis. The aim of this program is to foster new directions of innovative chemistry that stems from natural metalloenzymes or proteins.

Taken together, natural metalloenzymes and reactions are well-known in the construction of C-C bonds, C-N bonds, C-O bonds, and N-N bonds. But the mechanisms are still obscure, this program supports the design of biomimetics to inspire the discovery of new technologies that not only alleviate atmospheric pollution caused by greenhouse gases but also improve human beings' health.

<p>1. 추천주제</p>	<p>생명체 내 분자 시스템 코드 중에서 금속 효소(metalloenzymes)의 활성 부위에 관한 연구는 합성, 촉매, 생물의약품 및 재생 에너지 등의 다양한 분야에서 진행되고 있음 제안된 생체모방 금속 복합체에 관한 기초 연구는 다양한 스핀 상태를 가진 금속 중간체(Metal intermediates)의 메커니즘 및 전자 스핀에 관한 다음과 같은 연구내용이 포함되어 있음.</p> <ol style="list-style-type: none"> 1. 작은 분자들의 활성화를 위한 생체모방 전이금속 모델로 O₂, CO₂, N₂ 등의 신진대사 상 재생 에너지 및 산화환원의 항상성등이 포함된 생물학적 화학적 프로세스 연구 2. 금속-X (M-X, X = O, N, C) 반응 메커니즘 중간체의 스핀 밀도 및 다중성에 의한 화합물의 구조 및 반응성 연구 3. 생체모방 금속 촉매를 이용하여 화학 에너지로 변환시키는 등의 재생 에너지 분야 및 전구약물(Pro-drug)으로 응용하는 생물의학(Biomedicine) 분야 등의 응용 연구 <p>궁극적으로 생체모방 금속 촉매 연구를 통해 재생 에너지 개발로 대기 오염을 완화하고 새로운 약물을 개발하여 인간의 건강을 개선하는 새로운 기술 개발을 목표로 하고 있음</p>
<p>2. 추천사유</p>	<ul style="list-style-type: none"> ○ 물 분해에 의한 수소 에너지 생산의 느린 동역학 반응 등의 문제점을 해결하기 위해 생체모방 금속 촉매를 사용하는 고효율 물 분해 촉매 물질의 개발은 친환경 에너지 개발에 기여할 수 있음 ○ 생체모방 금속 촉매를 이용한 세포 독성이 없는 항암제 등의 전구약물 연구 개발은 합성 신약 개발에 기여할 수 있음 ○ 화학과 생명과학의 생체모방 금속 촉매 구조체 연구와 촉매 반응공정 연구를 위한 화학공학 뿐만 아니라 이를 응용하는 재생 에너지 개발의 환경 에너지공학 및 신약 개발의 의약학이 융합된 연구 분야임 ○ 현재는 귀금속을 사용하는 금속 촉매 개발 연구는 많이 수행되었으나 가격 효율 등의 문제점이 있으나 생체모방 금속 촉매 연구는 아직 미비하여 연구 가치가 높음 ○ 중국은 생체모방 금속 촉매 연구 연구가 활성화 되어 있고 상대적으로 우수한 생물의학과 연료전지 분야에서 중국과 협력이 국내 연구 활성화에 도움이 될 수 있음
<p>3. 기타의견</p>	<ul style="list-style-type: none"> ○ 생체모방 금속 촉매 연구는 화학, 생물, 화학공학, 에너지공학, 환경공학, 의약학 등 다양한 학문 분야 연구자들이 참여하는 공동 연구과제들이 제안될 수 있음 따라서 한중 양국의 다른 분야 연구자들이 참여하는 융합형 공동 연구과제 제안을 장려함 ○ 또한 공동 연구과제 선정시에 다양한 연구분야 및 응용분야 연구과제들이 선정될 수 있도록 함