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Japan Science and Technology Agency (JST)
5-3, Yonbancho, Chiyoda-ku, Tokyo 102-8666

JST to fund six projects as a part of the EIG CONCERT-Japan framework of the Strategic International Collaborative Research Program (SICORP)

The Japan Science and Technology Agency (JST) (HASHIMOTO Kazuhito, President) has approved funding for six new joint research projects in the research field of "Design of Materials with Atomic Precision," in collaboration with eight funding agencies from seven European countries as a part of the EIG CONCERT-Japan framework under the Strategic International Collaborative Research Program (SICORP)*1 (Attachment 1, 2).

EIG CONCERT-Japan is an international joint initiative to support and enhance science, technology and innovation (STI) cooperation between Japan and European countries (Attachment 3).

In 2022, the ninth EIG CONCERT-Japan call for proposals was conducted from May 9 to July 18 in the research field of "Design of Materials with Atomic Precision," to which a total of 11 proposals were submitted. Following an in-depth evaluation by a scientific committee (Attachment 4) and subsequent deliberations between participating funding agencies, it has been decided that JST will jointly fund six projects. The period of research support is three years, during which Japanese researchers in each project receive up to 18.2 million JPY.

*1 EIG CONCERT-Japan:
The CONCERT-Japan was funded by the European Union (EU) as one of their international cooperation activities within the ERA-NET (European Research Area Network) of the Seventh Framework Programme for Research and Technology Development (FP7). Its continuation, the EIG CONCERT-Japan program, aims to further develop existing cooperation between European countries and Japan by promoting and enabling effective collaboration in science and technology research. (http://concert-japan.eu/)

Attachments

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Annex: Overview of the EIG CONCERT-Japan Joint Call on "Design of Materials with Atomic Precision"

Enquiries

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Attachment 1

EIG CONCERT-Japan
Projects Selected for Funding (2022)

	Title	Researcher Country/Name/Affiliation/ Position	Research Abstract
1	Atomic-level control of AlGaN hetero-interfaces for deep-UV LED (AtLv-AlGaN)	Japan KANGAWA Yoshihiro Research Institute for Applied Mechanics, Kyushu University Professor Bulgaria Vesselin Tonchev Faculty of Physics, Sofia University Associate Professor Poland Pawel Kempisty Institute of High Pressure Physics, Polish Academy of Sciences Assistant Professor	The purpose of this project is to develop deep-ultraviolet LEDs that contribute to the destruction and inactivation of RNA and DNA of coronaviruses and bacteria. Specifically, (1) a team from Poland and Japan will analyze physical properties such as adsorption probabilities of precursor atoms and molecules on the crystal growth surface, and (2) a team from Bulgaria will develop a digital twin (a digital replica of real space): step dynamics simulation code implementing the obtained physical properties. (3) A team from Japan will predict the crystal growth conditions to obtain atomically flat surfaces/interfaces by machine learning using the developed digital twin. Based on the above findings, (4) a team from Japan will fabricate deep-ultraviolet LEDs by AlGaN metal-organic vapor phase epitaxy, contributing to the realization of a clean, safe and secure society through joint research by four teams from three countries.
2	Design and Control of Single Molecule Junctions (DECOSMOL)	Japan FUJII Shintaro School of Science, Tokyo Institute of Technology Research Associate Professor Spain J. Manuel Cuerva Organic Chemistry Department, Granada University Full professor M. Teresa González Molecular Electronics, Fundación IMDEA Nanociencia Senior Scientific Researcher	This project aims to elucidate the mechanisms underlying the physical properties characteristic of single molecule junctions (SMJs). Specifically, the Spanish team will be responsible for the molecular design of SMJs as well as their conductance and thermopower characterization, while the Japanese team will be primarily responsible for transport characterization and structural analysis. The Czech team will conduct theoretical analysis to elucidate the conducting properties of SMJs, and will feed the results back to the Spanish team for molecular design. Since the interaction with the electrode changes the intrinsic properties of the molecule in the SMJs, such as electrical and magnetic properties and reactivity, the control of

		Czech Republic Héctor Vázquez Institute of Physics, Czech Academy of Sciences Senior scientist	these properties and the structural identification itself are issues to be addressed. This trilateral collaboration is expected to solve these problems by integrating molecular design, precise structural analysis, and theoretical analysis of SMJs, leading to the realization of single-molecule devices.
3	Epoch-making ferroic fluids based multi-functional materials (FerroFluid)	Japan ARAOKA Fumito Center for Emergent Matter Science, RIKEN Team Leader	This project is aiming at developing new multiferroic materials and device applications based on the new class of ferroic fluids, i.e. ferroelectric nematics and columnars. Towards these ambitious goals, a multi-lateral consortium, consisting of four expert teams from Japan, Poland, Hungary, and Czech Republic, is organized. Japanese, Polish, and Hungarian teams adopt various state-of-the-art physical analysis techniques, such as cryo-TEM (Poland), resonant soft X-ray (Poland, Japan) and nonlinear optical imaging/spectroscopy (Japan) which are sensitive to electronic and geometrical conditions surrounding atoms in molecules, and dynamic electrorheology (Hungary). The Polish team will manipulate nanoscopic structures and construct devices based on the ferroic fluids, and the Japanese team will evaluate their performances. The Czech team is responsible for the molecular design and synthesis for suitable ferroic materials, based on the feedback from the other groups.
		Czech Republic Vladimira Novotna Institute of Physics, Czech Academy of Sciences Researcher	
		Hungary Peter Salamon Institute for Solid State Physics, Wigner Research Centre for Physics Researcher	
		Poland Magdalena Majewska Department of Chemistry, University of Warsaw Postdoctoral Researcher	
4	Machine-learning-driven bottom-up design of atomically-layered heterostructures for green H2 production (MLALH)	Japan Mohammad Hussein Naseef Al Assadi RIKEN Center for Emergent Matter Science, RIKEN Researcher	This proposal aims at understanding, designing, and synthesising atomically controlled heterostructure thin films for electro- and photocatalyst H2 production. The proposed workflow starts with: 1. high throughput density functional calculations to produce a training set 2. employing machine learning to extrapolate the

		Spain Jose Julio Gutierrez Moreno Barcelona Supercomputer Center Researcher	search domains to millions of heterostructures 3. synthesis and characterization of the outstanding predictions using atomically controlled thin-film techniques This proposal will rely on state-of-the-art theoretical guidance based on DFT and machine learning—screening over millions of heterostructures—and controlled synthesis of samples using pulsed laser deposition and atomic layer deposition systems by the Japan group and the Spain group, to be evaluated by the Turkey team. This way, the quality of the synthesized samples will supersede the common and vast literature in the field of electrochemistry that relies on the wet-synthesis techniques, which are inherently atomically imprecise and inhomogeneous in composition, size, and interfacing facets.
		Turkey Esmaeil Doust Khah Heragh Tüpraş Energy Center, Koç University Researcher	
5	Precise Control of Nanoporous Materials in Multi-dimensional Morphology ($PCoN\text{-}M^3$)	Japan OKUBO Tatsuya School of Engineering, The University of Tokyo Professor	Porous materials are widely used as catalysts and adsorbents, and are important materials for solving environmental and energy problems. In order to achieve excellent performance, it is essential to control the morphology of porous materials like nanoparticles and nanosheets. However, it is still difficult to control the defects and arrangement at the atomic level, and thus, sufficient performance and durability cannot be obtained. This research aims to achieve designable synthesis and performance improvement of porous materials with various morphologies by precise control at the atomic level. The Japanese group is an expert in synthesis and can synthesize various porous materials using their own technology. The counterpart group, on the other hand, is capable of advanced analysis. It is expected that the collaboration between the two countries will enable, for the first time, precise control at the atomic level and its analysis.
		Czech Republic Jiří Čejika Faculty of Science, Charles University Professor	
		Spain David Pedro Serrano Granados Thermochemical Processes Unit, IMDEA Energy Institute Professor	

6	Phonon engineering in precisely assembled atomically thin layers (PETITE)	Japan NOMURA Masahiro Institute of Industrial Science, The University of Tokyo Professor	Phonon and heat transport properties in atomic-scale thin films of two-dimensional materials such as graphene and transition metal chalcogenides, stacked with precisely controlled number of layers and twisted angles, will be investigated. Moiré fringes are produced in these materials depending on the combination of materials and interlayer angles, and we aim to explore the unique transport properties brought about by the new periodicity and anisotropy of these materials. Specifically, the Spanish team with expertise in material fabrication, the Japanese team with expertise in thermal phonon transport measurements, and the Polish team with expertise in elastic wave and phonon transport measurements will collaborate. No single team in the world is capable of carrying out this research alone, and this collaboration is expected to have academic significance in clarifying the heat transport properties of anisotropic two-dimensional material systems and in developing advanced thermal management technology.
		Spain Marianna Sledzinska Catalan Institute of Nanoscience and Nanotechnology Research Engineer	
		Poland Bartlomiej Graczykowski Faculty of Physics, Adam Mickiewicz University Associate Professor	

* Project Leaders are underlined

Attachment 2

EIG CONCERT-Japan

Participating Funding Agencies

Country	Funding Organization
Japan	Japan Science and Technology Agency (JST)
Spain	National State Agency (AEI)
Slovakia	Slovak Academy of Sciences (SAS)
Czech Republic	Czech Academy of Sciences (CAS)
Czech Republic	Ministry of Education, Sports, Youth and Science (MEYS)
Turkey	The Scientific and Technological Research Council of Turkey (TUBITAK)
Hungary	National Research, Development and Innovation Office (NKFIH)
Bulgaria	Bulgarian National Science Fund (BNSF)
Poland	National Centre for Research and Development (NCBR)

Attachment 3

EIG CONCERT-Japan

Partner Institutions

The EIG CONCERT-Japan consortium is made up of the following 14 funding agencies from 11 European countries and Japan:

Country	Partner Institution
Japan	Japan Science and Technology Agency (JST)
Spain	National State Agency (AEI)
Slovakia	The Slovak Academy of Sciences (SAS)
Czech Republic	Czech Academy of Sciences (CAS)
Czech Republic	Ministry of Education, Youth and Sports (MEYS)
Germany	DLR Project Management Agency (DLR)
Turkey	The Scientific and Technological Research Council of Turkey (TUBITAK)
Norway	The Research Council of Norway (RCN)
Hungary	National Research, Development and Innovation Office (NKFIH)
France	The National Center for Scientific Research (CNRS)
France	Agence Nationale de la Recherche (ANR)
Bulgaria	Bulgarian National Science Fund (BNSF)
Poland	National Centre for Research and Development (NCBR)
Lithuania	Innovation Agency Lithuania

Attachment 4

EIG CONCERT-Japan

Scientific Committee Member List

Country	Name	Affiliation	Role
France	Dr. David Berthebaud	National Centre for Scientific Research	Chair
Bulgaria	Dr. Vera Marinova	Institute of Optical Materials and Technologies	Member
Czech Republic	Dr. Stefan Vajda	J. Heyrovsky Institute of Physical Chemistry	Member
Hungary	Dr. Györgyi Kaptay	University of Miskolc	Member
Japan	Dr. ENDO Akira	National Institute of Advanced Industrial Science and Technology	Member
Poland	Dr. Katarzyna Matras-postolek	Cracow University of Technology	Member
Slovakia	Dr. Milan Tapajna	Slovak Academy of Sciences	Member
Spain	Dr. Cané Ballart	The Institute of Microelectronics of Barcelona	Member
Turkey	Dr. Bali Sinan	Izmir Institute of Technology	Member

Annex

Overview of the EIG CONCERT-Japan Joint Call on "Design of Materials with Atomic Precision"

1. Prospective Applicants

Researchers are required to form consortia which must include partners from Japan and at least 2 European countries. Research leaders are required to possess adequate insight and experience to effectively implement their proposed joint research during their research period.

2. Evaluation Process

Proposals were subjected to evaluation by online peer review and an evaluation committee made up of experts nominated by the participating funding agencies. The participating funding agencies then met to decide on project selection, which was based on discussion of the results of that comprehensive evaluation.

3. Evaluation Criteria

- Scientific excellence
  - Sound research concept and quality of objectives
  - Ambition, innovative potential and uniqueness of the research idea
  - Scientific track–record, potential of the partners (including publications in scientific journals)
  - Scientific standing of the organizations the applicants belong to

- Impact of project results
  - Impact of the project on the scientific field, community
  - Contribution to enhancing innovation capacity and integration of new knowledge
  - Expected exploitation and dissemination of the results
  - Added value of the multilateral project consortium

- Implementation
  - Quality and effectiveness of the methodology
  - Feasibility of the work plan (in relation to governance, adequate budget, resources, time schedule)
  - Collaborative interaction and complementarity of project partners
  - Expected sustainability of the collaboration
  - Interdisciplinarity
  - Involvement of early-stage researchers and gender balance