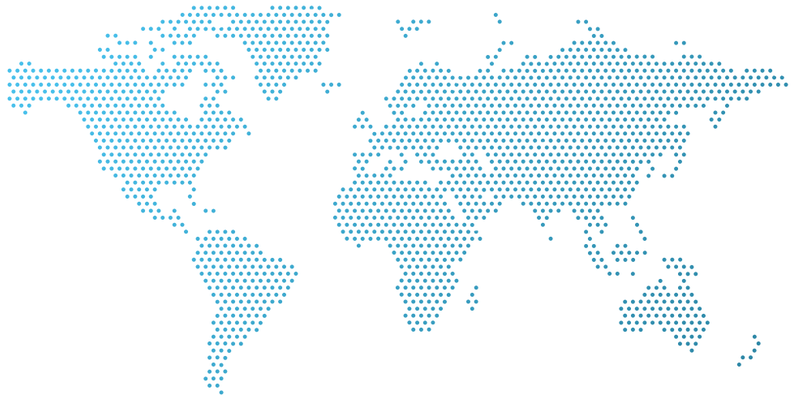


# SMSE
## PROFILE

上海交通大學 SHANGHAI JIAO TONG UNIVERSITY

材料科学与工程学院 School of Materials Science and Engineering

# CONTENTS

# SMSE VISION

Starting from 1952, Materials Science and Engineering (MSE) of Shanghai Jiao Tong University is one of the first national key subjects with first level priority in China. The Materials Science and Engineering program at SJTU has been consistently ranked in the top 1 ‰ of the ESI in the recent over 10 years. Its ranking reached the global 20th and the domestical 4th in the 2021 QS World University Rankings in Material Science. SMSE has been aiming to cultivate high-level talents with a solid and complete professional knowledge structure, a strong ability of self-dependent innovation and international competitiveness in the field of materials science and engineering, in order to meet the needs in scientific research, engineering application, scientific and technological innovation as well as organization and management.

SMSE

# 01

# ABOUT SMSE

SMSE has a total of 370 faculty and staff, and 1847 students. More than 85% of full-time faculty have international academic background and/or work experience. The SMSE campus has offices and labs located across 9 buildings with a total area of 40,000 square meters. SMSE is striving to build a world-class research institute to solve the scientific and engineering challenges of today and the future while pushing the boundaries of innovation and discovery.

SMSE

# SMSE FACTS

**466** Undergraduate Students

**1381** Graduate Students

**11** International Scholars

**26** Countries Represented by International Students

**258** Faculty Members

**154** Post-doctoral Researchers

**112** Staff Members



# HISTORY

**1926**
Materials Group of Industrial Research Institute

**Est. in 1952**
Research Institute of Heat Treatment of Metals

**1988**
Among China's First National Earliest Key Science Disciplines

**Est. in July 1997**
School of Materials Science and Engineering (SMSE)

**2002**
Materials Science and Materials Process Engineering were both ranked China's National Key Disciplines

**2007**
Materials Science and Engineering was among China's First National Earliest First-Class Key Disciplines

**2017**
Materials Science and Engineering was included in the "double world-class project"

# 02 ACADEMICS

Material Science is the bridge to connect fundamental science to applied science. Materials are the basis for human survival and development.

We encourage our students to explore the interest of science, venturing into unfamiliar fields of knowledge, and discovering new passions. Along the way, we have nurtured some of the best quality minds, and have made great achievements in scientific research, social contribution and cultural inheritance. In order to further upgrade the academic environment, we are collaborated with top universities in the world and supporting students for international exchange.

# PROGRAMS

## LIST OF CORE COURSES FOR ALL DEGREE PROGRAMS

**SEMESTERS**:FALL

| UNDERGRADUATE DEGREE | M.Sc./M.Eng. DEGREE | PH.D DEGREE |
|---|---|---|
| Fundamentals of Materials Science & Engineering-1 | Fundamentals of Functional Materials | Advanced Thermodynamics of Materials |
| Physics of Materials | Multiscale Materials Modeling and Simulation | Microscopy and Spectroscopy Characterization |
| Mechanical Behavior of Materials | Smart Polymeric Materials and Applications | Multiscale Materials Modeling and Simulation |
| Materials Lab (1) | Supramolecular Materials and Biomedical Applications | Supramolecular Materials and Biomedical Applications |
| Biomedical Materials | Advanced Electronic Information Materials, Advanced Biological Functional Materials | Advanced Electronic Information Materials |
| Composite Materials | | Advanced Biological Functional Materials |



**SEMESTERS**:SPRING

| UNDERGRADUATE DEGREE | M.Sc./M.Eng. DEGREE | PH.D DEGREE |
|---|---|---|
| Fundamentals of Materials Science & Engineering-2 | Fracture in Engineering Materials | Fracture in Engineering Materials |
| Thermodynamics of Materials | Advanced Thermodynamics of Materials | Fundamentals of Functional Materials |
| Materials Chemistry | Kinetics of Materials, Fundamentals of Solidification | Kinetics of Materials |
| Mechanics of Materials | Microstructural Evolution and Control During Joining of Metallic Materials | Fundamentals of Solidification |
| Physical Properties of Materials | Hydrogen Science: Fundamentals and Applications | Microstructural Evolution and Control During Joining of Metallic Materials |
| Structural and Chemical Characterization of Materials | Nonlinear Constitutive Models with Applications in Forming | Hydrogen Science: Fundamentals and Applications |
| Principles of Materials Processing | | Nonlinear Constitutive Models with Applications in Forming |
| Materials Lab (2) | | Academic Lectures |


# GLOBAL STUDY

SMSE offers the best learning experience to our students and the most rewarding working environment for the faculty and staff members, and the most effective service to industry and the society. To provide internationally recognized education in the field of materials science and engineering, we devoted to cultivating students with strong problem solving abilities in science and engineering, global vision, as well as communication and teamwork skills.



## DUAL DEGREE PROGRAMS

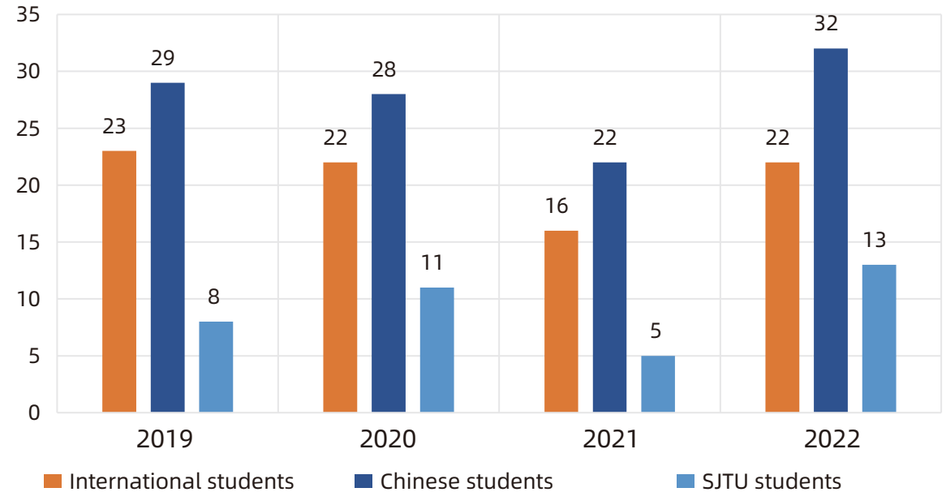
National University of Singapore, Singapore (PhD)
KTH Royal Institute of Technology, Sweden (PhD/MS)
Monash University, Australia (PhD)
Ecole Nationale Supérieure d'Arts et Métiers, France (MS)
Institute National Polytechnique de Grenoble, France (MS)
……

## EXCHANGE PROGRAMS

Nanyang Technological University, Singapore
Harvard University, United States
University of Oxford, United Kingdom
Delft University of Technology, Netherland
Technische Universität München, Germany
Technische Universität Dresden, Germany
Tohoku University, Japan
Osaka University, Japan
……



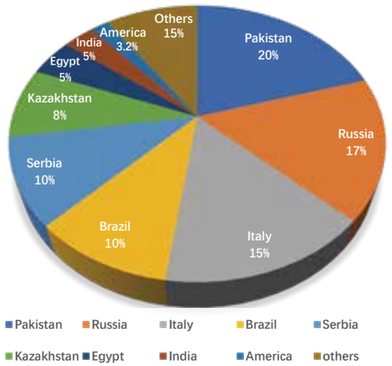

## SUMMER PROGRAM




Participants in the latest few years

## "ZHI-HONG" INTERNATIONAL SUMMER SCHOOL

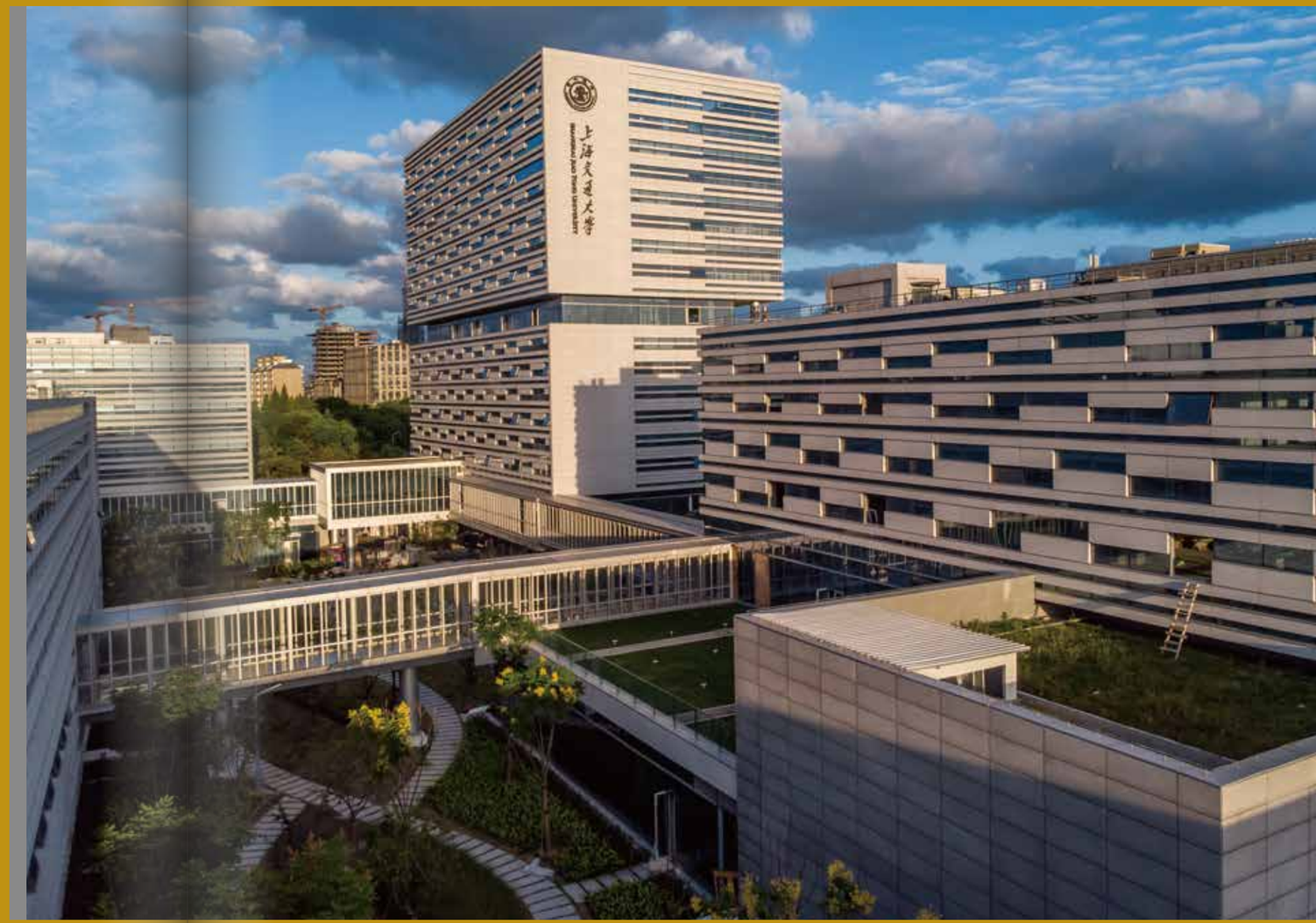
The "Zhi-Hong" International Summer School is a two-week summer program organized by SMSE, SJTU. Students from both overseas and China have been selected to attend the "Zhi-Hong" summer school in the past 6 years. Many experts and scholars from world renowned universities and institutes were invited to share their experiences in the field and present academic lectures to the students. "Zhi-Hong" summer school also offered various activities, for instance, Shanghai touring, cultural experience, talent shows, etc.




From 18 Countries

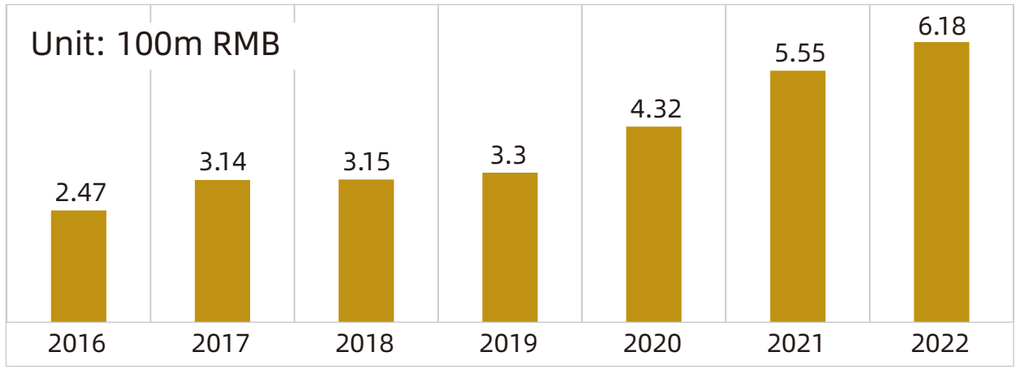
# 03 RESEARCH

The School of Materials Science and Engineering of Shanghai Jiao Tong University aims at materials science & engineering frontier and national vital demands to carry out research and attaches great importance to the cross of disciplines. We have established 14 high-level research institutes and 7 national research centers. SMSE has achieved breakthroughs in areas such as light alloy materials, metal matrix composites, material intelligent thermal manufacturing and emerging directions such as clean energy materials, biomedical materials, advanced information materials, materials genome and hydrogen science. Works from the school have been published in prestigious academic journals such as ***Nature*** and ***Science.***

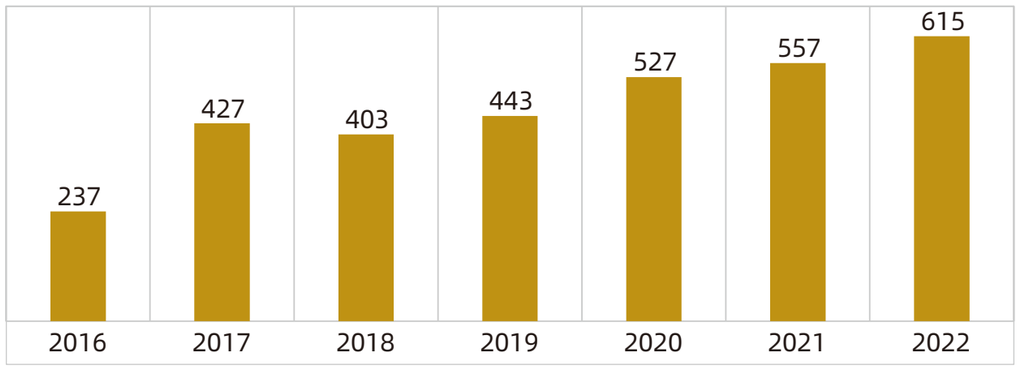


SMSE

## RESEARCH GRANTS




## PUBLISHED PAPERS(SCI)







## PATENTS

**2016 ▶▶ 2022**

**1072** Granted Patents | **13** PCT

# BREAKTHROUGHS IN RECENT YEARS


**Title :** A solvent- and vacuum-free route to large-area perovskite films for efficient solar modules
**Group:**
Prof.Liyuan HAN, Prof. Xudong YANG, Assoc.Prof. Han CHEN
**Paper link:**
https://www.nature.com/articles/nature23877


**Title :** Stabilizing heterostructures of soft perovskite semiconductors
**Group:**
Prof.Liyuan HAN, Prof. Xudong YANG, Assis.Prof. Yanbo WANG
**Paper link:**
https://www.science.org/doi/10.1126/science.aax8018


**Title :** Exceptional plasticity in the bulk single-crystalline vander Waals semiconductor InSe
**Group:**
Prof.Xun SHI, Assoc.Prof. Tianran WEI
**Paper link:**
https://www.science.org/doi/10.1126/science.aba9778


**Title :** Mastering the surface strain of platinum catalysts for efficient electrocatalysis
**Group :**
Prof.Jianbo WU
**Paper link:**
https://www.nature.com/articles/s41586-021-03870-z




**Title :** Giant electric-field-induced strain in lead-free piezoceramics
**Group :**
Prof.Yiping GUO
**Paper link:**
https://www.science.org/doi/10.1126/science.ade2964


**Title :** Living material assembly of bacteriogenic protocells
**Group :**
Prof. Stephan MANN
**Paper link:**
https://www.nature.com/articles/s41586-022-05223-w


**Title :** Transporting holes stably under iodide invasion in efficient perovskite solar cells
**Group:**
Prof.Xudong YANG
**Paper link:**
https://www.science.org/doi/10.1126/science.abq6235


**Title :** Liquid metal-based soft, hermetic, and wireless-communicable seals for stretchable systems
**Group:**
Prof.Tao DENG, Assoc.Prof.Wen SHANG
**Paper link:**
https://www.science.org/doi/10.1126/science.ade7341

# INSTITUTES & RESEARCH CENTERS

## INSTITUTE

### INSTITUTE OF FORMING TECHNOLOGY AND EQUIPMENT

Research Fields:
- Plastic Forming for Ferrous and Lightweight High Strength Materials
- Metal Precision Forming and Extreme Forming Technologies
- Theory of Plastic Deformation
- Multi-physics Numerical Simulation and Design Optimization
- Digital and Intelligent Manufacturing Technologies

### INSTITUTE OF COMPOSITE MATERIALS

Research Fields:
- Metal Matrix Composites
- Polymer Matrix Composites
- Novel Functional Composites

### INSTITUTE OF LIGHT ALLOYS

Research Fields:
- Advanced Casting Alloy Materials
- Liquid Forming and Surface Engineering
- Material Energy Field Processing
- Solid State Molding Technology
- Material Intelligent Design and Processing
- Mg-based Energy Materials
- Mg-based Biomedical Materials



### INSTITUTE OF SOLIDIFICATION SCIENCE AND TECHNOLOGY

Research Fields:
- Melt Structure
- Atomic Interaction and Diffusion
- Nucleation and Growth of Crystals
- Defects Formation
- New Metallic Materials Design
- Li-ion Battery
- Al-ion Battery

### INSTITUTE OF SPECIAL MATERIALS

Research Fields:
- Design of In-situ High Strength and High Toughness Aluminum Matrix Composites
- Multi Field Coupling Control of Aluminum Alloy Melt
- Liquid Phase Forming of Complex Components
- Integrated Forming of Large Parts
- Plastic Deformation and Recrystallization
- Spray Deposition Technology of Metal Materials
- Fatigue Fracture Behavior and Anti-fatigue Design of Metal Materials
- Additive Manufacturing Aluminum Based Composites for Key Components Preparation and Applications
- Non-destructive Characterization Technique of Neutron Diffraction
- Residual Stress Analysis of Material Components
- Neutron/High Energy X-ray Small Angle Scattering Technique
- Statistical Analysis of Material Nanostructures

## INSTITUTE OF PHASE TRANSFORMATION AND MICROSTRUCTURE OF DESIGN

Research Fields:
· Mesoscopic Mechanism and Simulation of Deformation and Toughening of Metals
· Microstructure Design for High Strength Steels
· Atomic Scale Structural Properties of Nano-porous Metals
· Key Technology of Water Quenching for Large Alloy Steel Parts

## INSTITUTE OF HIGH PERFORMANCE METALIC MATERIALS

Research Fields:
· Materials Genome Engineering
· High Temperature Heat-resistant Materials
· Rare Earth Permanent Magnetic Materials

## INSTITUTE OF ELECTRONIC MATERIALS AND TECHNOLOGY

Research Fields:
· Micro-nano Copper Interconnect Materials
· High Density Micro-bump Materials
· Low Temperature Bonding Materials & Interface
· Aqueous Grafting of Low-K Organic Insulating Films
· Large Crystal Fabrication for Cu Interconnect
· Nano-twinned Copper Interconnect Materials
· High-reliability Nanostructured Substrate



## WELDING AND LASER PROCESSING INSTITUTE

Research Fields:
· High-Efficiency Joining Processes
· Additive Manufacturing
· Welding Intelligent Control
· Modelling of Welding Process
· Laser Micro/Nano Manufacturing
· Functional Material Joining

## INSTITUTE OF INTELLIGENT WELDING AND PRECISION MANUFACTURING

Research Fields:
· Learning and Modeling of Welding Processes for Intelligent Welding Robots
· Numerical Modeling of Joining Processes and Adaptive Control Systems
· Scientific Theory of Intelligent Welding Manufacturing
· Multi-scale and Multi-physics Models for Various Welding Processes
· Regulation of Structure and Mechanical Properties of Additive Manufacturing
· Evolution Mechanism and Control of Surface Integrity in Grinding & Polishing

## INSTITUTE OF ADVANCED MATERIALS AND SOLIDIFICATION

Research Fields:
· Solidification Theory & Technology
· TiAl Based Alloys
· Metallic Glasses
· High-Entropy Alloys
· Functional Ceramics
· Solidification Equipment
· Computational Materials Science

## INSTITUTE OF MATERIALS MODIFICATION AND MODELING

Research Fields:
· Simulation Technology of Material Heat Treatment and Engineering Applications
· Microstructure and Properties of Advanced Alloys Characterization and Control

## CENTER OF HYDROGEN SCIENCE


Research Fields:
· Hydrogen Energy
· Hydrogen Agriculture
· Hydrogen Medicine



## INSTITUTE OF FRONTIER MATERIALS

IFM
Institute for Frontier Materials
前沿材料
Advancing Materials for Energy, Environment, and Electronic

Research Fields:
· Photovoltaic Materials & Devices
· Thermoelectric Conversion Materials & Devices
· Energy Harvest & Storage
· Photocatalysis
· Flexible Electronics
· Thermal Barrier Coating Materials for Major Projects

## RESEARCH CENTERS

· State Key Lab of Metal Matrix Composites
· National Engineering Research Center of Die and Mold CAD (ERC)
· National Engineering Research Center for Light Alloy Net Forming
· National Engineering Research Center for Nanotechnology (NERCN)
· International S&T Collaborative Bases (for Laser Manufacturing), MOST
· International S&T Collaborative Bases (for Nanotechnology), MOST
· International S&T Collaborative Bases (for Composite Materials), MOST

# SPECIAL EQUIPMENTS

| | |
|---|---|
| 1 | Specific Surface Area and Porosity Analyzer |
| 2 | Contact Angle Measuring Instrument |
| 3 | Thermo Scientific Spectra 300 (S)TEM |
| 4 | Micro-beam High-throughput XRD+XRF Characterization in Synchrotron Radiation Beamline |
| 5 | Three-dimensional and In-situ Processing Analysis Electron Ion Beam System |
| 6 | Spark Plasma Sintering System |
| 7 | JEM-ARM200F |
| 8 | K2 Summit Direct Detection Camera, DDC |
| 9 | High-throughput Micro-beam X-ray Diffractometer |
| 10 | GE Concept Laser M2 |
| 11 | High Power Fiber Laser Welding System |
| 12 | Nano Indentor |

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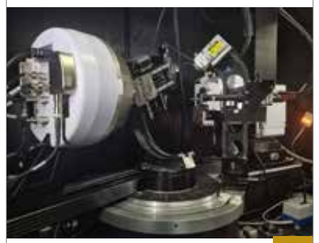
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# POST-DOCTOR RESEARCH

The School of Materials Science and Engineering of SJTU was one of the earliest schools that established Post-doctoral research platform. There are over 154 Post-doctoral researchers working at SMSE at the end of 2022, and the post-doctoral research platform has been evaluated as "Excellent" in the last round of assessment. SMSE Post-doctor Platform is focusing on the development of traditional features of "Material +" interdisciplinary research and has attracted many talented scholars around the world. Throughout the years of discovery, SMSE materials discipline has grown into a key base for cultivating high-level scholars.

**Please contact hrsmse@sjtu.edu.cn for further information.**

**POST-DOCTOR PLANS & PROJECTS**

- Post-Doctoral Innovative Talent Support Plan
- Shanghai Super Post-Doctoral Incentive Plan
- Post-Doctoral Special Funding
- Post-Doctoral Science Funding

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# GLOBAL CONNECTIONS

SMSE always takes "world-class" as our goal. SMSE supports and coordinates international activities both on campus and abroad for our faculties and students. As the pace of globalization has accelerated in the recent decades, we actively reached out for international cooperation, and welcomed distinguished scholars and international students to visit or study at SMSE. Today, SMSE has accomplished remarkable global achievements in talent cultivation, faculty development, research base construction and international joint education program. We are seeking and expanding the diversified academic exchange mode and hope to keep improving our international popularity and influence.

**ACADEMIC EXCHANGE**

SMSE sponsors many international academic activities such as SMSE Academic Masters Forum, SMSE Materials Frontier Forum and SMSE International "Yuan Ding" Program. We are consistently reaching out for collaborations and international exchanges to grasp the frontier materials science. SMSE has developed "Internet +" mode to improve faculty training and expands global vision and competence of students under the international environment background.

# COLLABORATIONS




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# CAREERS

SMSE never stops expanding and sharing knowledge, inspiring innovation, and preserving cultural and scientific information for future generations. We always devote in building a world-class team to lead SMSE for a better future.

## EXPERTISE FOR FACULTY POSITION APPLICATION

- Clean Energy Materials
- Biomedical Materials
- Advanced Information Materials
- Additive Manufacturing
- Intelligent Thermal Manufacturing
- Hydrogen Science
- Structural Materials

SMSE welcomes all researchers with background of Materials Science, Physics, Chemistry, Computational Materials Science and relevent experiences to join us. Please contact hrsmse@sjtu.edu.cn for further information.

## SUPPORTING PLANS & PROJECTS

SMSE supports intended talents with materials relevant experiences to apply for both national level and Shanghai municipal level plans and projects year.

Please scan the QR code or enter the link:
https://www.wjx.top/vm/QWCRA2c.aspx to sign up for the support programs.

# CONTACT US

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http://en.smse.sjtu.edu.cn