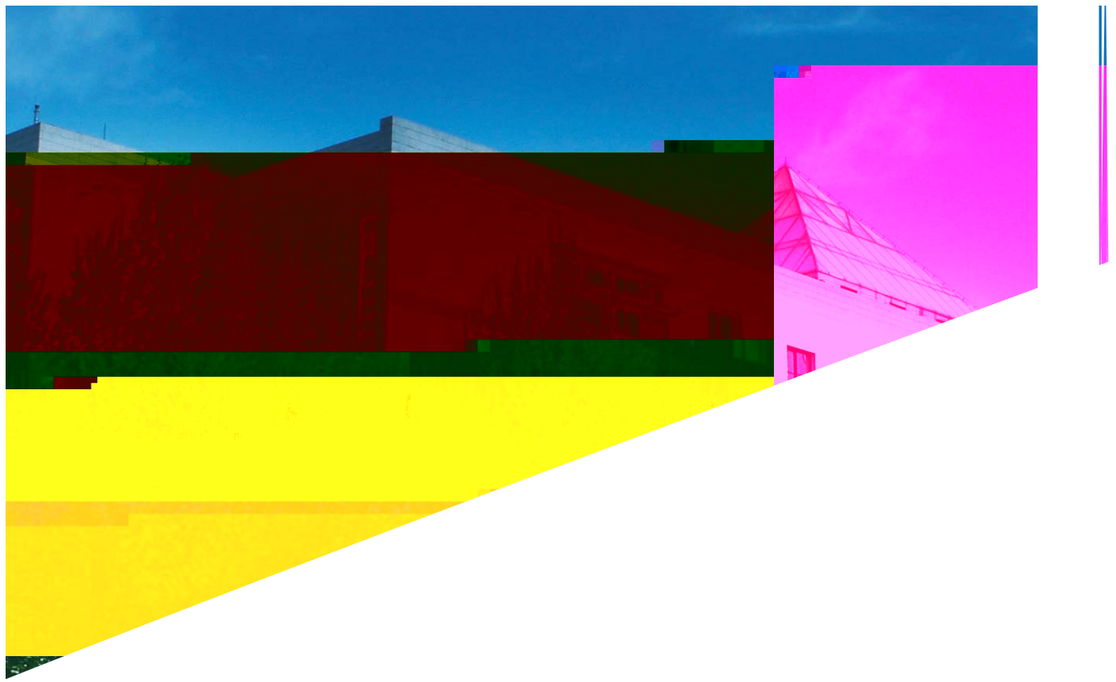
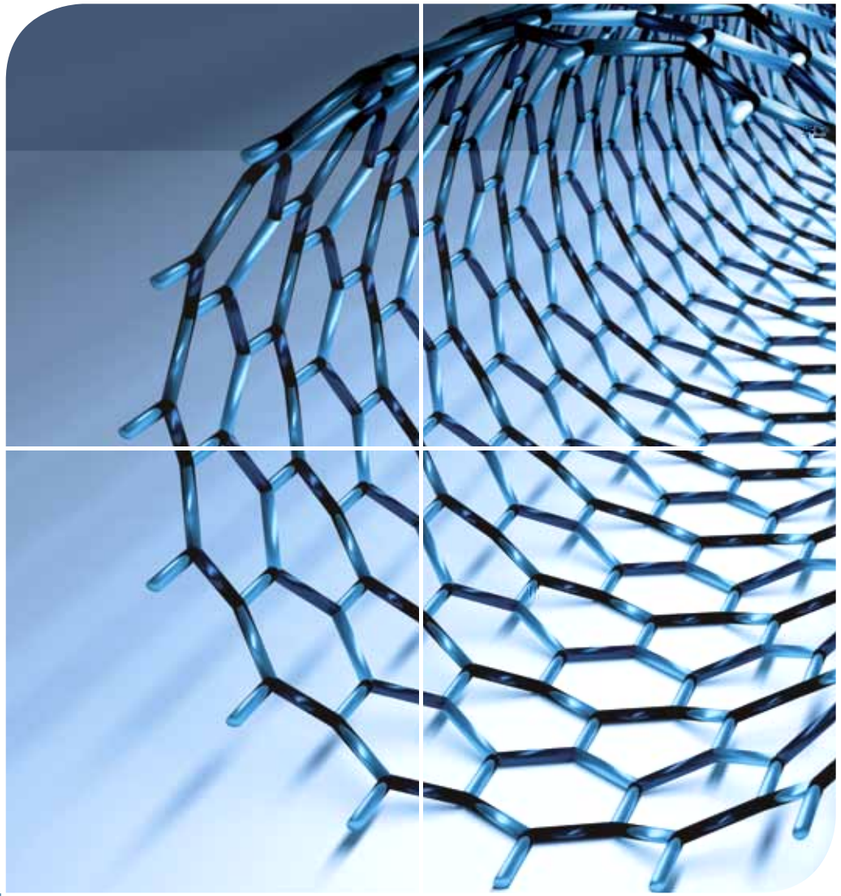
SCHOOL OF MATERIALS SCIENCE AND ENGINEERING



Materials are the physical foundation for a strong national economy, for social progress, and for state security. As the foundation of a wide range of industries, materials have been the driving force for scientifc and technological development during the evolution of human civilization. Materials science and engineering have always been infrastructural, guiding and permeable, and thus the level of materials research, together with its educational level, also reflects the comprehensive strength of a country. A key requirement therefore for Tsinghua University to achieve in its strategic objective of becoming a world-class university in the 21st century is the development of materials research and materials education to a world-class level.

Based on this goal, the guiding mission of the School of Materials Science and Engineering (SMSE) is to establish an internationally advanced-level platform including materials preparation, analysis & testing, and device research, and to strengthen cooperation with relevant academic research areas in other countries, thereby complementing each other's advantages, and driving forward progress within the materials science discipline in Tsinghua University. In addition, the school should actively take part in relevant major national research missions, as well as develop primary innovation within the state innovation system through the realization of breakthroughs in critical materials research, in techniques and devices, and in major theoretical advances and innovations. Our school also recognizes the importance of promoting cooperation with enterprises, allowing the conversion of scientifc and technological achievements into productive forces, thereby resulting in great economic benefts to meet the demands of the state, of social development, and of national defense, and to promote Tsinghua University as a knowledge innovation base for internationally advanced level academic studies and basic-research fndings.

Education of students is one of the most fundamental and important missions of our school. For undergraduate student education, our primary focus is on nurturing the overall ability of the students, in line with the philosophy of "deepening in foundation, broadening in vision, emphasizing in practice, and strengthening in personal quality". For graduate student education, both innovation ability and international competitiveness are emphasized, in line with a philosophy of "science as the foundation, creativity as the mission". The SMSE is dedicated to its goals of building up a faculty with top-ranking competitiveness and developing research facilities with frst-class standards, thereby allowing scientifc research with the highest impact to be carried out, and facilitating the development of innovative educational programs, so as to attract and support talented young students to enroll and study in our school.



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itself first founded in 1988 by the merger of several divisions within Tsinghua University,

The SMSE has a highly competitive faculty, consisting at present of 52 professors, 31 associate professors, 8 Assistant Professors, and 19 senior engineers, as well as 8 engineers/staff. With regard to educational activities we are devoted to the training of talented students with an international perspective and creative spirit, as well as with a solid theoretical understanding of materials science and outstanding research ability. Currently more than 370 students are pursuing their doctoral degrees within the School. Additionally more than 350 students are pursuing MSc degrees, with more than 470 undergraduates pursuing their bachelor degrees, including over 30 international students.

A number of laboratories and centers are also hosted within the SMSE. These include the State Key Laboratory of New Ceramics and Fine Processing, the Education Ministry Key Laboratory for Advanced Materials, the Education Ministry Key Laboratory for Advanced Materials Processing Technology, the Beijing National Center for Electron Microscopy, and the Center for Testing & Analyzing of Materials of the SMSE, as well as other teaching and research institutions. In addition, the SMSE also encompasses several research centers and national production-study-research bases, including the Research Center for Bainitic Steels, the Research Center of Magnesium and Aluminum Alloys Processing Technology, the Beijing High-tech Ceramic Materials and Processing National Scientific and Technological Corporation Base, and the International Research Center of Functional Materials, appointed by Ministry of Science and Technology.

Research activities within the SMSE follow the frontiers of international science as well as supporting national strategic needs. We not only encourage original research on basic science, but also actively promote applied research to address national major scientifc, technological, and industrial demands. The number of SCI-cited papers published annually has ranked first in Tsinghua University for many years, highlighting the highly productive research output of faculty members within the SMSE. Regarding both the publication output and the number of citations of published papers, the SMSE has been ranked as one of the best institutes in the world for the past 10 years according to the ISI statistics, and first in China over a continuous two year period according to the most recent national frst-class discipline evaluation.In 2017, the School was ranked among the top 9 world universities for materials science, by both the US News Ranking by Subject and the QS World University Rankings by Subject.

370+

Doctoral Candidates

350+

Master Degree Candidates

470+

Undergraduate students

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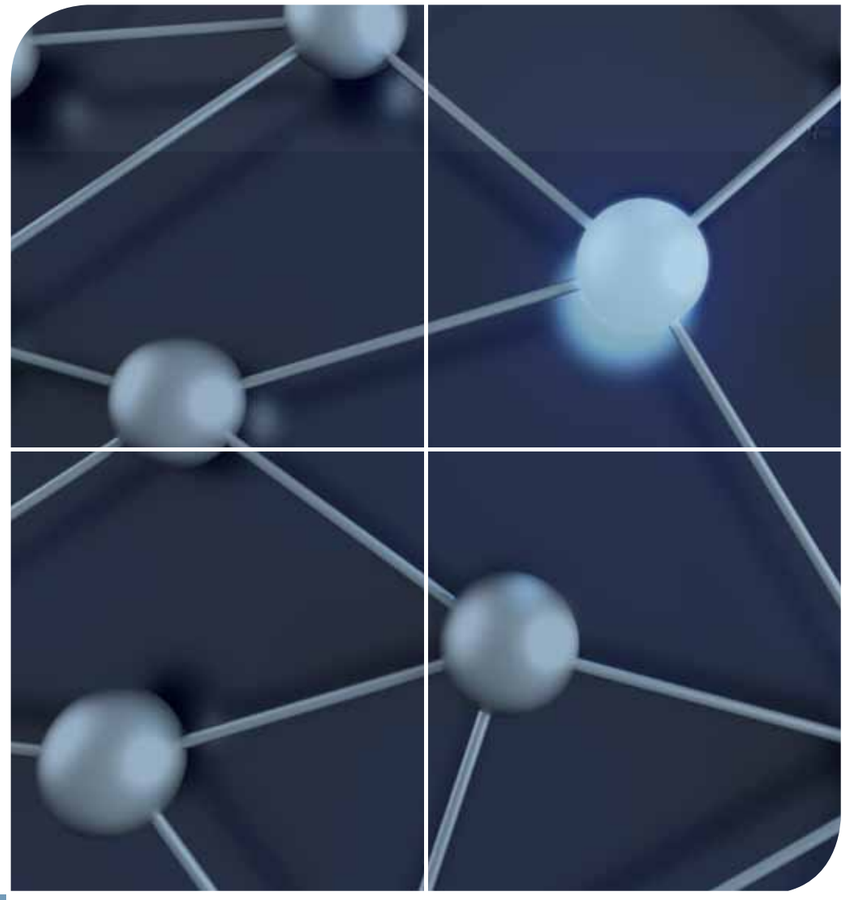
Name	Research area	E-mail Address
	Self-assembly and biomimic materials	caiqiang@tsinghua.edu.cn
	Ferroelectric, ferromagnetic, ferroelastic and multiferroic thin films and devices; Density functional theory (DFT) calculations	lqc3@psu.edu
	Modelling of materials processing, solidification theory	Hongbiao.dong@gmail.com
	Fine powder processing; particle composition and shape modification	gaigs@tsinghua.edu.cn
	Therm-mechanical processing of metals and micro-texture analysis	awgodfrey@tsinghua.edu.cn
	New carbon materials; adsorbents; photocatalyst; carbon electrodes	zhhuang@tsinghua.edu.cn
	Computer aided design of foundry technology and numerical simulation of solidification process	jingtao@tsinghua.edu.cn
	New carbon materials; materials for energy storage/conversion; materials for environmental protection; heat conduction material and thermal management	fykang@tsinghua.edu.cn
	Materials modeling and simulation	wslai@tsinghua.edu.cn
	Biomaterials; Ion beam metallurgy	lhd-dms@tsinghua.edu.cn
	Piezoelectric and thermoelectric materials and their microfabrication technology	jingfeng@tsinghua.edu.cn
	Ferroelectric; Piezoelectric and functional ceramics	llt-dms@tsinghua.edu.cn
	Polymer composites	
	Metal matrix nanocomposites	zqqlwz@tsinghua.edu.cn
	Porous metals; Solidification and cast alloys	yanxiang@tsinghua.edu.cn
	Radiation effects; Life management and safety of nuclear energy systems; Nano/thin-Film Materials	zcli@tsinghua.edu.cn
	Nanomaterials; Perovskite/Quantum dot/Dye-sensitized solar cells	hong-lin@tsinghua.edu.cn
	Functional composite materials	linyh@tsinghua.edu.cn
	Interaction of special physics fields and materials; Advanced metallic materials	liuw@tsinghua.edu.cn
	Advanced Materials Processing Technology, Integrated Computational Materials Engineering.	liubc@tsinghua.edu.cn
	Computational materials science; Ion-solid interactions and ion beam modification of materials; Thin film and nuclear materials	dmslbx@tsinghua.edu.cn
	Functional materials	cwnan@tsinghua.edu.cn
	Thin films and devices	panf@tsinghua.edu.cn
	High performance ceramics; Materials chemistry and physics	panw@tsinghua.edu.cn
	Modeling and simulation of solidification	shen@tsinghua.edu.cn
	Advanced ceramic materials; Biomaterials and nanomaterials	shenzhijian@tsinghua.edu.cn
	Functional ceramics	tzl@tsinghua.edu.cn
	Structural ceramics and ceramic matrix composites; Porous ceramics	wangca@tsinghua.edu.cn
	Functional ceramics	wxh@tsinghua.edu.cn
	Biomaterials; Tissue engineering and regenerative medicine	wxm@tsinghua.edu.cn
	Micromagnetic theory for Applied Magnetism, Recording Physics	weidan@tsinghua.edu.cn
	Ecomaterials; Rare earth catalytic materials	duanweng@tsinghua.edu.cn
	Engineering and structural ceramics	xzp@tsinghua.edu.cn
	Light metals and processing technology; Maro/micro modeling and simulation of casting processes	smxiong@tsinghua.edu.cn
	Modeling and simulation of materials processing technology; metal solidification/casting; new casting materials and processes	scjxqy@tsinghua.edu.cn
	Preparation technology of fne ceramics with complex parts; hollow/solid micro/nano-sphere	jlyang@tsinghua.edu.cn
	Metallic materials	zgyang@tsinghua.edu.cn

Name	Research area	E-mail Address
	Amorphous alloys; Metallic materials and heat treatment	kfyao@tsinghua.edu.cn
	Structure of Materials; Transmission Electron Microscopy; Computational Materials Science	ryu@tsinghua.edu.cn
	Functional Ceramics	yuezhx@tsinghua.edu.cn
	Microstructure development during solid state phase transformations and related applications	zhangwz@tsinghua.edu.cn
	Thin films; Plasmonic materials; Low dimensional materials	zjzhang@tsinghua.edu.cn
	Spintronic materials and devices; Low dimensional materials and nanostructure; Computational materials science	xzzhang@tsinghua.edu.cn
	Laser materials processing and micro-nano fabrication	zhml@tsinghua.edu.cn
	Metamaterials, functional ceramics	zhouji@tsinghua.edu.cn
	Nanomaterials	hongweizhu@tsinghua.edu.cn
	Electron Microscopy in Material Science and Engineering	jzhu@tsinghua.edu.cn
	Solar cell devices and functional thin films	dmzhuang@tsinghua.edu.cn
	New functional non-equilibrium materials	chennadm@tsinghua.edu.cn
	Metal foam materials; Wear resistant metal materials	xchen@tsinghua.edu.cn
	Ultrasonic motors; Piezoelectric actuators, MEMS	chuxiangcheng@tsinghua.edu.cn
	Mechanical behavior of ceramic materials	gong@tsinghua.edu.cn
	New Carbon Materials and Powder Metallurgy	gongqianming@tsinghua.edu.cn
	Modeling and Simulation on Solidification and Casting Processes	zqhan@tsinghua.edu.cn
	Modeling and simulation of solidification and metal casting	kangjw@tsinghua.edu.cn
	Light alloys	jg.li@tsinghua.edu.cn
	Electronic materials and devices	liliangliang@tsinghua.edu.cn
	Functionally graded materials; Nuclear materials	yhling@tsinghua.edu.cn
	Properties and applications of 1- and 2-dimensional electronic materials	liuk@tsinghua.edu.cn
	Advanced solidification technology and advanced metallic materials	yuanliu@tsinghua.edu.cn
	Study of X-ray diffraction	miaowei@tsinghua.edu.cn
	Bonding of ceramics to metal, interface of ceramics and metal	caike@tsinghua.edu.cn
	Advanced structural ceramics	lhqi@tsinghua.edu.cn
	Functional polymer nanocomposite; Oxides for Lummescence application	shyang_mse@tsinghua.edu.cn
	application of zirconia and alumina ceramics，dental materials	wjsi@tsinghua.edu.cn
	Magnetic films and spintronic devices	songcheng@tsinghua.edu.cn
	Biomaterials	sunxiaodan@tsinghua.edu.cn
	Piezoelectric materials; Thermoelectric materials	wang-ke@tsinghua.edu.cn
	Nanomaterials; femto- and attolitre science & technology	jqwei@tsinghua.edu.cn

Name	Research area	E-mail Address
	Energy storage and fexible electronics	wuhui@tsinghua.edu.cn
	Environmental catalytic materials	wuxiaodong@tsinghua.edu.cn
	Functional thin films for brain inspired computing and mobile communication	zengfei@tsinghua.edu.cn
	Advanced structural ceramics, Lithium ion battery	zengzq@tsinghua.edu.cn
	Metallic materials; Phase transformation and computer simulation	chizhang@tsinghua.edu.cn
	Porous metals & metal foams; Directional solidifcation; Forming processing of light metals & alloys	huawei.zhang@gmail.com
	Organic/Inorganic hybrid biomaterials; Cancer nanotechnology; Magnetic biomaterials	lyzhao@tsinghua.edu.cn
	Functional thin films	zhaoming2013@tsinghua.edu.cn
	Electron microscopy in materials science; Electron magnetic circular dichroism; Magnetic materials	xyzhong@tsinghua.edu.cn
	Carbon nanocomposites and advanced materials processing technology	yfzhu@tsinghua.edu.cn
	Phase transformation; Metallurgy; Structural materials	hao.chen@tsinghua.edu.cn
	Computational Materials/Physics; Synchrotron X-ray techniques; High temperature alloy (aeroengine)	zhipeng_guo@tsinghua.edu.cn
	Metallic glasses and energy storage materials simulation	jbliu@tsinghua.edu.cn
	Two-dimensional materials; Electrochemical catalysis; Energy conversion/storage devices	lvruitao@tsinghua.edu.cn
	Multiferroic and functional oxide materials	Ma-jing@tsinghua.edu.cn
	Eco-materials; Environmental catalytic materials	ranr@tsinghua.edu.cn
	Metallic glasses and structure characterizations	shaoyang@tsinghua.edu.cn
	Thermoelectric materials, thermal barrier coating materials, intercalation compounds	wancl@tsinghua.edu.cn
	Computer Materials Science, Phonon Properties, Materials Genome	xuben@tsinghua.edu.cn
	Biodegradable electronics, grid scale energy storage	lanyin@tsinghua.edu.cn



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SCHOOL OF MATERIALS SCIENCE AND ENGINEERING

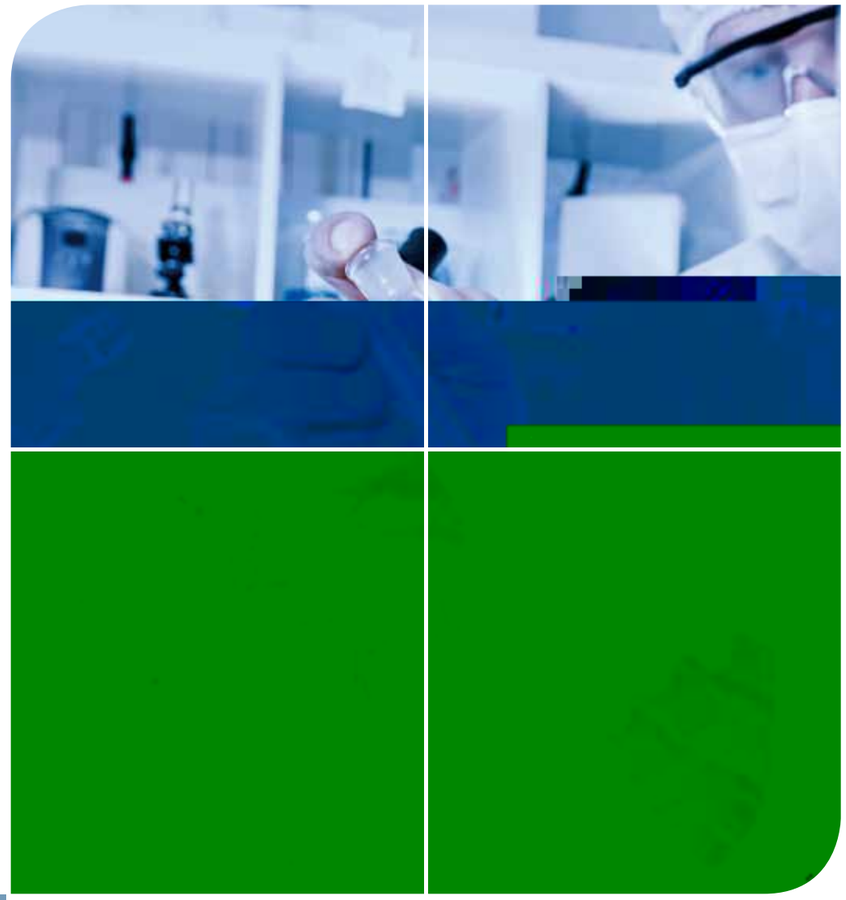
- State Key Laboratory of New Ceramics and Fine Processing
- Key Laboratory of Advanced Materials of Ministry of Education
- Key Laboratory of Advanced Materials Processing Technology of Ministry of Education
- National Center for Electron Microscopy in Beijing
- Center for Testing & Analyzing of Materials

- Department of Materials Physics and Chemistry
- Department of Inorganic Non-metallic Materials
- Department of Metallic Materials
- Department of Materials Processing Engineering
- Department of Composite Materials

4

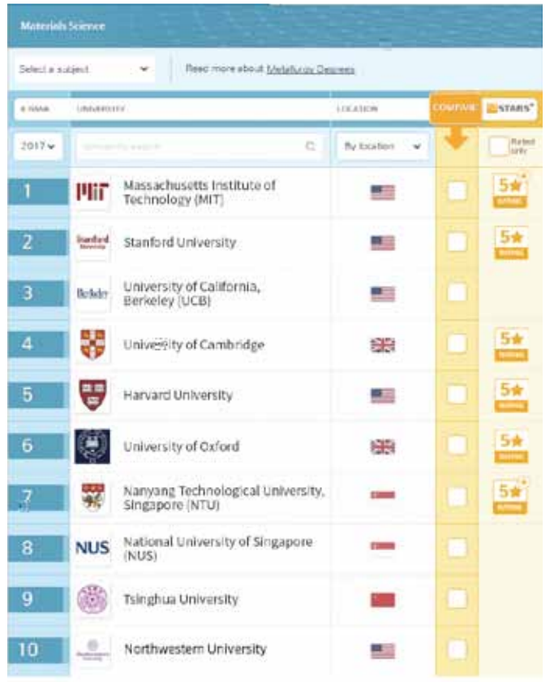
The undergraduate program has a current student body of about 520. The teaching philosophy is to offer an education program giving students a solid background in mathematics, physics and chemistry, and to provide an understanding of the underlying principles of materials science, including the relationships between composition, structure, properties and processing. The teaching curriculum also emphasizes the learning of practical skills to identify and solve engineering design problems. The curriculum builds on core foundational courses as well as a variety of laboratory classes which offer hands-on laboratory experience with access to state-of-the art equipment. Bilingual courses such as “Fundamentals of Materials science” and “Electron Microscope Analysis”, are also provided, as well as a series of practical training courses, including summer programs on microelectronics and machine-shop skills. Students also have the opportunity to carry out research with faculty members through the Student Research Training (SRT) program, and to participate in exchange programs with a range of overseas universities including those in France, Japan, Canada, Taiwan and Hong Kong.

The graduate program provides education leading to a degree either of Master of Science, Master of Engineering, or Doctor of Philosophy in Materials Science and Engineering, with an average yearly intake of about 120 MSc students and 60 PhD students. The program emphasizes multidisciplinary research in a variety of areas, including metals, ceramics, composites, polymers, bio-1(w)-1(a089 T0io-1(letro)nic)]TJ0



5 Scientific

The QS World University Rankings by Subject (2017)



The SMSE aims to carry out cutting edge research at the forefront of materials science, while at the same time providing support for both domestic industry and national strategic research projects. Over the past ten years, faculty within the SMSE have received many awards and published more than 300 peer-reviewed SCI papers annually, ranking #1 in terms of academic output at Tsinghua University. More than 40 national patents are filed and issued within the School every year.

The SMSE consistently ranks #1 in evaluation of national first-level subjects. In 2017, the School was ranked among the top 9 world universities for materials science, by both the US News Ranking by Subject and the QS World University Rankings by Subject.

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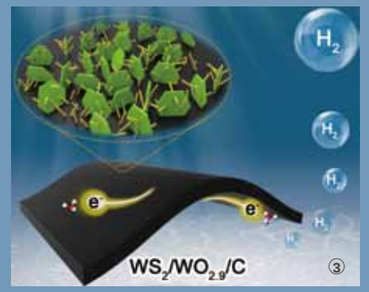

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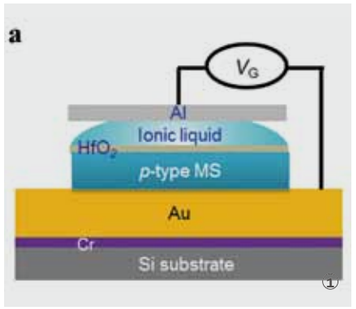
Highly Efficient Hydrogen Evolution

- Electronic ceramics
- Functional ceramic composites
- High-temperature structural ceramics
- Advanced processing of ceramics
- New energy and environmental materials
- Bio-ceramics

The State Key Laboratory of New Ceramics and Fine Processing was founded by the central government in 1991. Currently, Prof. PAN Wei is the director of the lab, and Prof. XUE Qikun, member of the Chinese Academy of Science, is the chairman of the Academic Committee. The lab possesses a comprehensive set of advanced facilities for the preparation and characterization of ceramics.

The lab is devoted to the development of fundamental and pioneering science and technology of advanced ceramics, and to exploration of frontier research in the area of materials science. Since its establishment the lab has made many pioneering and distinctive achievements and has played a leading role in many aspects of ceramic science and application research. The lab also hosts the National Scientific and Technological Corporation Base for Beijing High-tech Ceramic Materials and Processing. International academic exchanges and collaborations are vigorously promoted in the lab. As a result the lab maintains a high level of exchange and cooperation through joint projects with universities, research institutes and companies in many countries and regions. Every year the lab also supports open projects for accepting visiting researchers both from within China and from overseas.



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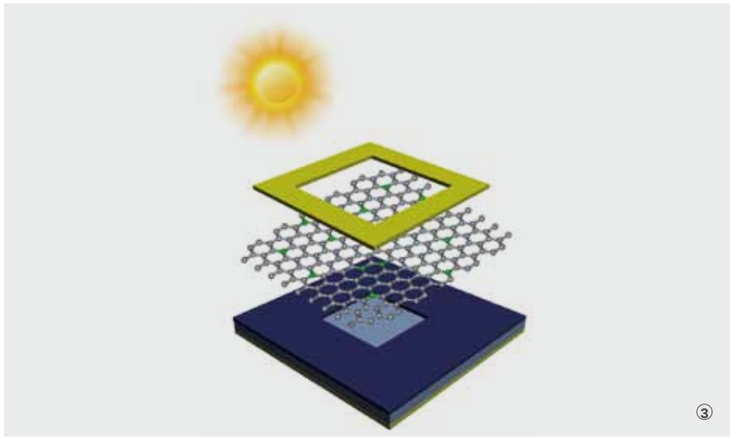
Electric field control of the room-temperature



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Efficient Photovoltaic Conversion

- Interaction of ion-beams with materials
- Formation and evolution of material microstructure
- New metal materials
- Information and electronic materials
- New polymer materials
- Nuclear materials
- Biomaterials and bionic materials
- Ecomaterials

The Key Laboratory of Advanced Materials of Ministry of Education was foundedin 1993. Currently, Prof. ZHANG Zhengjun is the director of the lab, and Prof. ZHUJing is the chairman of the Academic Committee. The lab possesses a comprehensive set of advanced facilities for the preparation and characterization of a wide range ofadvanced materials.

At present, materials science, material physics and chemistry, the nuclear fuel cycle and related materials, and condensed matter physics, all of which belong to the lab, are national key disciplines. Over the years the lab has established itself as a multi-disciplinary research platform for the development of cross-disciplinary advanced materials.

The influence of the lab both in the domestic and international materials field is continually being strengthened, supported by the regular organization of international academic exchanges and collaborations. As a result the lab currently maintains routine exchange and cooperation in joint projects with a range of universities, research institutes and companies in many countries and regions. The lab also supports open projects for accepting visiting researchers both from within China and from overseas.

The National Center for Electron Microscopy in Beijing was founded in 2006, with funds from The Ministry of Science and Technology of China, The Ministry of Education of China and the Beijing Municipal Science and Technology Commission.The center provides an open, innovational and high-level national scientifc research infrastructure.

Within the center there are six transmission electron microscopes (including two aberration-corrected TEMs), three scanning electron microscopes, a focused ion beam system, and a full set of sample preparation facilities. The guiding principle of the center, based on the goal of supporting high-level scientific research, is to offer high-quality technical service

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X-ray fluorescence spectrometer

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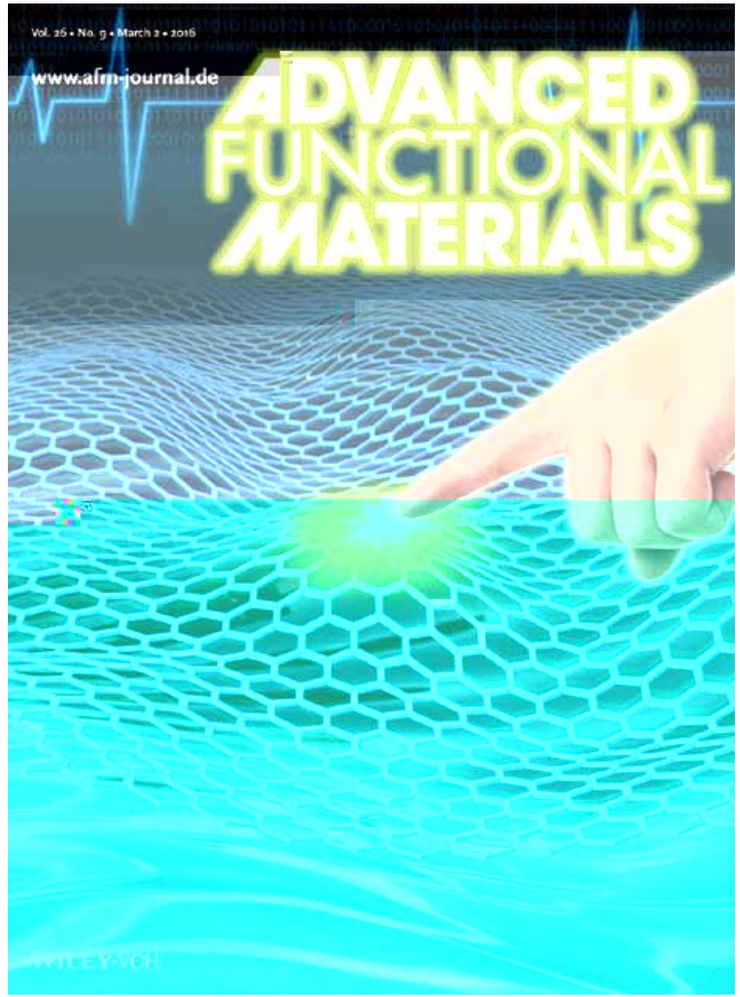
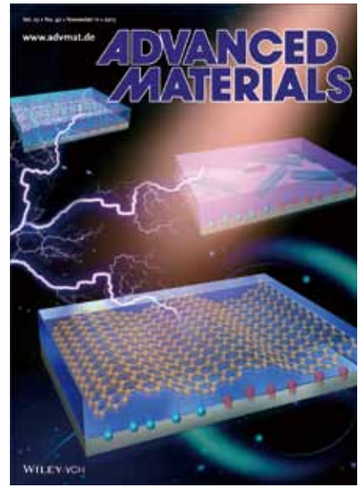
X-ray diffractometers

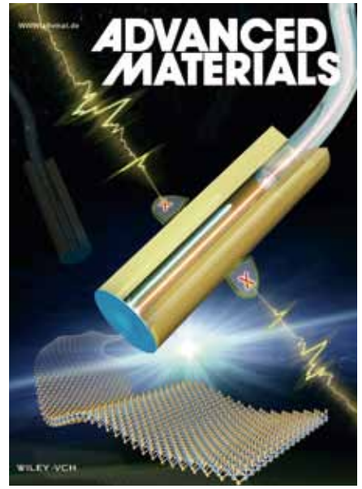
The Center for Testing & Analyzing of Materials (CTAM) was founded in 1980 as the Center for Testing & Analyzing of Materials of Institute of Materials Science of Tsinghua University. The CTAM was renamed as the Center for Testing & Analyzing of Materials, School of Materials Science and Engineering, Tsinghua University in 2012.

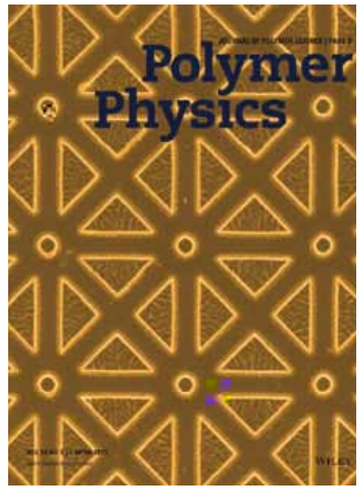
The center currently supports more than thirty large-scale precision analytical instruments, with a particular strength in X-ray diffraction facilities, placing it in a leading position in the country compared to similar labs in terms of the number of instruments and their function, the degree of openness of access, and the development of in-house technology. For many years the center has provided an extensive range of training and open services.In addition to the X-ray diffraction equipment the center contains a range of advanced instruments, including a physical properties measurement system(PPMS), a superconductivity quantum interference device-vibrating sample magnetometer (SQUID-VSM), a vibrating sample magnetometer (VSM), an X-ray photoelectron spectrometer (XPS), an Auger electron spectrometer (AES), an electron probe micro-analyzer (EPMA), a high-temperature synchronous thermal analysis system, a thermal analysis – Infrared - MS system, an X-ray fluorescence spectrometer, a quenching & deformation dilatometer, and a nano-indenter.

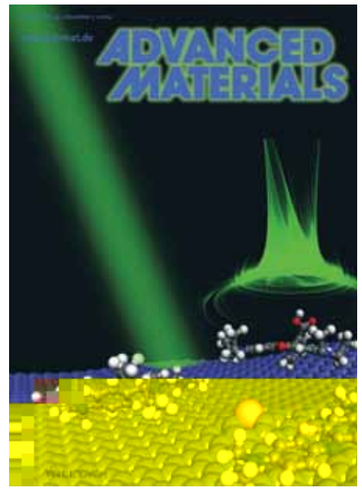
The Center for Testing & Analyzing of Materialshas become an open platform for testing and analysis, providing services to researchers, scientists, and engineers both within and outside Tsinghua university, and is one of four university-level test analysis platforms. The main task of the CTAM is the testing and analysis of the structure, composition and properties of a wide range of materials.











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The joint Master's program between Tsinghua University (THU) and the Tokyo Institute of Technology (TIT), established in 2004, allows the exchange every year of a number of master program students between THU and TIT. Students enrolled in the joint program are directed by advisors from both institutions and have the opportunity to be awarded MSc degrees from both THU and TIT. The aim of the joint program is to combine the advantages of both institutions in student training, and to foster the education of talented graduates, with broad knowledge and expertise in different research fields. At the same time students enrolled in this joint program have the opportunity to share their knowledge ofChinese and Japanese cultures and traditions, as well as to improve their language skills in Japanese, English and Chinese.

Students enrolled in the joint program from TIT and THU study for a total of 2.5 years and 3 years, respectively. After finishing course-work requirements in their own university, students are sent to the partner university to carry out a program of scientific research and study for one year. The focus with the SMSE for this joint program is on projects related to nanotechnology. To date more than 60 students have been enrolled in the joint program, with 40 of these already graduated. The joint program significantly enhances the international outlook of participating students as well as their innovation and problem solving skills.

Each year the SMSE hosts more than 200 visits from overseas guests, many of whom deliver academic talks and take part in seminars and workshops at Tsinghua University. Similarly, between 300 and 400 visits abroad are made by faculty and students each year to participate in international conferences and exchange programs, and to pursue research collaborations. Additionally each year the SMSE hosts academic exchange activities for more than 10 foreign students, who carry out research for periods of between a few weeks and several months.

Our faculty members are also active internationally with regard to professional activities, with a total of more than 30 faculty members serving as international editorial board members, committee members, and members of advisory boards. Emphasis is also placed on international research collaboration. In recent years faculty members within the SMSE have participated in more than 30 collaborative research projects with top universities and companies from countries including the USA, Japan, France, Germany, Sweden, and the Republic of Korea.

The SMSE takes an active role in supporting international academic and educational collaboration by participating in the organization of a number of international academic symposia, including those withuniversities and institutes in the USA, Italy, Germany, Spain, Japan, the Republic of Korea, and Singapore.

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These include the annual student festival gala and talent shows, as well as a variety of volunteer activities, and all kinds of sporting events. The school pays close attention to the support of extra-curricular activities and encourages student personal development by participation or organization of such activities. A number of students making an outstanding contribution to either community support or extra-curricular activities are recognized each year by the School of Materials Science and Engineering.