



The laboratory building of SCCE spans an area of 8000 m<sup>2</sup>.

## 80 Years and still going strong: The School of Chemistry and Chemical Engineering at the Beijing Institute of Technology

**T**he School of Chemistry and Chemical Engineering (SCCE) at the Beijing Institute of Technology (BIT) has a long history—dating back to 1940—and its best years are still ahead.

Eighty years ago, it was founded in Northwestern China as the Yan'an Research Academy of Natural Sciences, later merging with the Department of Chemistry and Chemical Engineering of the Northern University. It relocated to Beijing in the early 1950s, and continued to grow by incorporating the Department of Chemistry of Université Franco-Chinoise, which was founded in the capital in 1920. The school was renamed as the School of Chemical Engineering and Materials in 1991, and was then separated into four divisions in 2002: the School of Chemical Engineering and Environment, the School of Materials, the School of Life Science, and the School of Chemistry. Its current form was created in 2016, by combining the School of Chemistry and the School of Chemical Engineering and Environment.

Since then, the SCCE has continued its appetite for growth, incorporating the biomechanical engineering department in 2017, and is now operating across five campuses in China. According to the Essential Science Indicators (ESI) chemistry ranking, the SCCE is now in the top 1.6‰ globally, ranked at number 198 in ESI's international listings.

### Cutting-edge research

Research from the SCCE has covered the major areas of modern chemistry and chemical engineering in the fields of material, energy, environmental and biological sciences, and engineering. Several key research areas include theoretical molecular simulation; inorganic cluster synthesis and advanced applications; molecular design and structural control of functional nanomaterials; electrochemistry and green catalysis; the synthesis and properties of functional organic molecules and polymers; renewable energy chemical engineering; and synthetic biology and biocatalysis engineering.

"The SCCE program targets cutting-edge original research and advanced developments in international chemical communities to meet the challenging demands of national defense and industry," says Jiatao Zhang, dean of the SCCE. "In particular, our research on polyoxometalate chemistry, doped quantum dots, graphene and metal-organic framework (MOF) materials, solid oxide fuel cell technology, yeast fermentation of biofuels, and theoretical chemistry, have attracted international interest."

The school's focus is split: one major emphasis is on theoretical and computational chemistry—developing and improving calculation methods and strategies to design new functional materials and explore micromechanisms for complex systems. Its other emphasis is experimental chemistry, including single-atom level and cluster catalysis, graphene 2D nanosheets, 3D superstructures science, and industrial-level chemical engineering.

The SCCE has a number of research groups with international reputations, including the laboratory of Guoyu Yang, whose research on metal-oxo clusters and their catalytic, magnetic, and nonlinear optical properties recently gained notoriety. His cluster chemistry research



Teachers guide and train students on how to operate 700M NMR testing.

will strengthen the SCCE's chemical engineering applications, and in particular, stimulate the study of the defense potential and application of high-energy materials and rare metals. Yang was awarded the second-class prize of the National Natural Science Award for his research in 2016.

Another key research group at the SCCE is led by Kening Sun's team, who are working on energy conversion and clean environmental chemistry. In collaboration with the SCCE's basic research on energetic molecules, their work will drive the development of new military and civilian chemical engineering applications for batteries and clean energy. In addition, they made significant breakthroughs in high efficient distributed power generation technology of SOFCs. Professor Sun was awarded the second-class prize of the National Technological Invention Award for his research in 2018.

The SCCE also has spearheaded original research achievements, such as 3D graphene frameworks for electricity generation and MOFs for air filters. Additionally, the Institute for Synthetic Biosystems at SCCE conducts multidisciplinary research (synthetic biology, chemistry, and

engineering) to design and construct a microbial cell factory that will enable a clean, green, and efficient bioprocess for developing new drugs and for the biosynthesis of natural products.

As these research groups and the SCCE play a major role in developing China's industries and defense systems, the school has received a lot of support from China's central government. The SCCE has been awarded 126 grants totaling over RMB 100 million (USD 14 million) in the last five years from a number of government bodies, including the National Natural Science Foundation, the Ministry of Science and Technology, and the Ministry of Education.

## Stellar students and faculty

The growing SCCE can now boast 514 Chinese undergraduates and nearly 50 international students.

It offers five undergraduate programs: physical chemistry, applied chemistry, chemical engineering and technology, pharmaceutical engineering, and energy and chemical industry. Classes are taught in both Chinese and English.

The applied chemistry program has been categorized as a national key program of China, while the chemical engineering and technology and physical chemistry undergraduates belong to the key programs of the Ministry of Industry and Information Technology.

The SCCE runs over three campuses and has 123 faculty members. It also has 245 Ph.D. candidates, over 430 Master's students, and offers the Undergraduate Mentoring System network to help link students with professional mentors.

In its nearly 80-year history, the school has graduated more than 300,000 talented professionals including scholars, entrepreneurs, and government leaders. Graduates include the China's former Premier, Li Peng, and Chinese Minister of Energy Yicheng Huang. A number of alumni have become academics at the Chinese Academy of Engineering and other well-known organizations.

## Successful collaborations

The school has won a number of awards for its research, including two second-class prizes of the National Natural Science Award, a first-class prize in the Natural Science Award of the Ministry of Education, and an Outstanding Young Chemist Award.

Graduates from the SCCE have an employment rate of over 98%, and in the past five years, the school has undertaken more than 120 scientific research projects. The school been awarded nearly 100 national invention patents.

The SCCE's undergraduate and graduate students have published 727 Science Citation Index (SCI) papers in last five years, of which 31 were ESI highly cited papers; and 8 Ph.D.s and 14 Master's students received Excellent Thesis Awards from BIT.

"The SCCE's fast-growing international reputation has qualified it as one of China's most important platforms for scientific research and personnel training in chemical sciences and engineering," says Zhang.

As part of its expanding global outreach, the SCCE has collaborations and partnerships with several research institutions. It has recently implemented "2+2" joint education projects with Canada's largest engineering school, the University of Waterloo, and with Queen's University in the United Kingdom. Students who are part of these

projects will be trained and granted bachelor degrees from both universities.

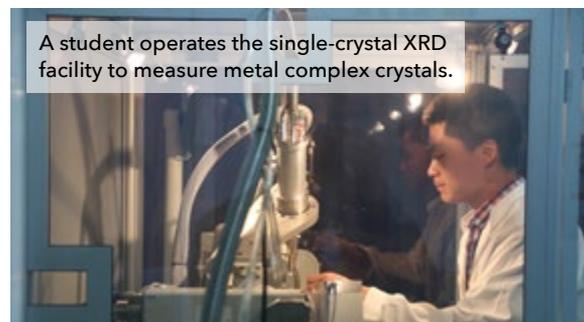
"We have also launched China's first 'Triple One Center,' focused on special molecules, nanoscience, and technology," adds Zhang.

The Triple One Center, based at the Beijing campus, brings together the expertise of international academics to stimulate joint research projects.

"Because of this center, several foreign professors, including Omar M. Yaghi from the University of California, Berkeley Wolfgang Knoll from the Austrian Institute of Technology, and J. Fraser Stoddart from Northwestern University in the United States, were recruited to our program as adjunct professors to stimulate scientific interaction and collaboration," says Zhang.

Zhang says that the SCCE is preparing to bring even more international academics to the Triple One Center in the near future to boost its research.

The SCCE programs also have close ties with other schools at BIT, including the Schools of Materials Science and Engineering, Physics, Mechanical Engineering, and Mechatronics Engineering.



A student operates the single-crystal XRD facility to measure metal complex crystals.

## Big ambitions

With a long-running history that has seen a number of mergers and reinventions, the school has great ambitions for new chapters of growth and development.

Zhang says that the SCCE's goals include strengthening the international visibility of BIT's chemistry and chemical engineering programs, attracting more high-level experts, and strengthening undergraduate and graduate education.

Plans include creating an international advisory board, expanding the number of English-language taught courses, and exploring more formal partnerships with foreign universities as well as providing more opportunity for overseas conferences.

"Our objectives in the next 10 years are to reach world-class level with leading original work in certain research fields, to raise a group of prominent scholars and outstanding young talents, and to establish an interdisciplinary center with top universities for both research and education," says Zhang.

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