**Polymer Materials Science and Engineering**

Polymer materials science and engineering is the subject on the design, synthesis, structure, property, processing, and application of polymer materials. This specialty trains the high-quality scientific researcher and engineering technician, who has the basic and professional knowledge of polymer materials and engineering, and also understands the relevant professional knowledge of the field of material science and engineering, for the traditional and emerging industries such as plastics, rubber, fibers, coatings, adhesives, petrochemical, energy, and aerospace and so on. The graduate could engage in scientific research, technological development, process design, production and management in the fields of design, synthesis, characterization, modification, processing, molding and application of polymer materials. Polymer materials are developing towards high performance, functionalization, intelligence, low pollution and low cost, and then have a widely application in many new high-tech fields, such as aerospace, modern communications, electronic engineering, bioengineering, medical and environment protection.

Basic courses of the specialty include Advanced Mathematics, Foreign Languages, General Physics, Computer Skill, Chemical Industrial Machine, Basic Chemistry, Organic Chemistry, Physical Chemistry, and Principles of Chemical Engineering. The core courses include Polymer Chemistry, Polymer Physics, Polymer Science Experiments, Processing Engineering of Polymer, Manufacture Engineering of Polymers, Polymer Characterization, and Introduction to Materials.

According to the subject category, four modules include plastic processing engineering, elastomer processing engineering, polymer material manufacturing engineering, and composite materials, are offered to the senior students, respectively.

This training of the practical ability and engineering ability is valued. The offered practical courses include metalworking, social practice, electrical and electronic practice, practice of specialty understanding, polymer specialty experiment, final year project, quality development and innovation, application software skill, professional practice, and military training. Engineering design courses include engineering drawing, mechanical design, automation instrument, principles of chemical engineering, and the process, design and practice courses of four professional modules.

The courses also cover English, computer, humanities education, quality development, economy, and enterprise management, to ensure a balanced ability on language, computer, personal, and management and so on.

**Major of Materials Science and Engineering**

Materials are substances which people use to fabricate goods, devices, components, machines. They are the matter foundation for human being to exist and develop. Based on physical and chemical properties, materials can be classified into four categories of metallic materials, inorganic non-metallic materials, polymers and composite materials which is composed by different materials. The aim of this major is to train professional senior personnel with the abilities of scientific research, technology development, engineering design, technique and economic management in the fields of metallic materials, inorganic non-metallic materials and polymers.

Information, materials and energy resources are called three supports for modern civilizations. New materials, information technology and biological technology are reckon as the important marks of new technology revolution which is represented by high-tech groups. The reason of such importance is mainly because materials has very close relations with constructions of national economy, national defense and the people's livelihood. Materials are also important matter foundation of information and energy resources. For instance, the hardware of the information technologies, such as magnetic record and chips, need the mater support of materials. The energy resource technology, such as solar cells and fuel cells, have to depend on the catalyst functions which are provided by materials.

In future, people can carry out more precise analysis to materials, from the atomic level to the electronic level, in order to obtain deeper understanding to the properties. As the results, people can fabricate materials with special structures, such as composite nano-structure, according to the requirement of properties. The resulted special materials, such as intelligence materials, catalyst materials, energy resource materials, information record materials and ecological environment materials, can satisfy the special requirement of different circumstances.

**The special disciplines of this major include:**

Fundamental Chemistry, Fundamental Chemistry Experiment, Organic Chemistry, Physical Chemistry, Engineering Drawing, Computer Drawing, Foundation of Mechanism Design, Applied Electrotechnology, Principle of Chemical Engineering, Introduction of Materials, C Programming, VB Programming, Principle of Microcomputer, Literature Retrieval and Scientific Writing, Technical Economy and Business Management, Application of Computer Technology in Materials Science, Scientific Report and Lecture, Advancement of Materials, Material Physics, Material Chemistry, Preparation and Processing of Materials, Methodology for Materials Measurement, Principle and Methodology of Electrochemistry, Metallurgy and Heat Treatment, Corrosion and Protection, Surface Engineering, Metal Materials, Inorganic Non-metallic Material Engineering, Powder Engineering, Fundamentals and Equipment for Thermal Engineering, Function Ceramic Materials.

**The elective special courses of this major include:**

Modern Electrochemical Method, Function Materials, Composite Materials and Applications, Technology Design of Inorganic Material Plant, Water Treatment Technology and Application of Corrosion Inhibitors, Polymer Science and Engineering, New Carbon Materials and Their Applications.

**The Practice Trainings of this major include:**

Cognition Practicum, Production Practicum, Metal Working Practice, Electrical and Electronical Practice, Basic Experiment for Materials Science and Engineering, Specialty Experiments, Curriculum Design of Mechanism Foundation, Final Practice and Thesis Writing.

**The paths for comprehensive quality improvement of this major include:**

General Education Courses, Tutorial System Training, Military Training, Practical Training, Interest Development and innovation, Application Program Practice

**Functional Materials**

The undergraduate major of Functional Materials at Beijing University of Chemical Technology (BUCT) provides education and training focus on biomaterials. Its predecessor was the first specialty of "Bio-functional Materials" at bachelor level in China approved in 2004 by the Ministry of Education of China. In 2009, the "Bio-functional Materials" was recognized as a feature specialty of Beijing city. In 2012, the Ministry of Education of China announced a new catalogue of undergraduate specialty settings. Followed the new catalogue, the "Bio-functional Materials" merged into the specialty of "Functional Materials". Thereafter, the "Bio-functional Materials" specialty in our university had been recruiting students national wide as "Functional Materials" specialty, and the enrolled students had been trained according to the original "Bio-functional Materials" program. Since 2018, all new students in the College of Materials Science and Engineering of BUCT have been enrolled as the specialty of “Materials”, i.e. a large specialty group of materials. One year after enrollment, student candidates of “Functional Materials” specialty will be selected from all sophomores based on their voluntary and academic record. Starting at the second college year, the students enrolled as “Functional Materials” will be trained according to the program of "Bio-Functional Materials".

Life science and new material science are the key disciplines in the 21st century. As an interdisciplinary subject of biology, medicine and materials science and technology, biomaterials is a new and high-tech subject which deals with the preparation, structure and function of materials related to life and medical technology as well as their processing and applications. Biomaterials is developing rapidly with each passing day. In the next decade, biomaterials, especially biomedical materials, will be one of the pillar industries of the future national economy with a growth rate of more than 15% per year.

**Fundamental courses and the specialized courses of the Functional Materials Major:** obligatory courses include Fundamental Chemistry, College Chemistry Experiments, Organic Chemistry, Engineering Graphics, Probability Theory and Mathematical Statistics, Technological Economy and Enterprise Management, Physical Chemistry, Biochemistry, Polymer Chemistry, Polymer Physics, Polymer Science Experiments, Introduction to Materials, Biomedical Materials, Performance Evaluation of Biomaterials, Preparation and Processing of Biomaterials, Polymer Characterization, Cellular and Molecular Biology, Biomedical Engineering, Lab Training on Biomaterials etc., and optional courses include Outlines of Materials, Computer Language and Programming, Theory and Applications of Computer Simulation, Applied Electrotechnics, Basis of Mechanical Design, Principles of Chemical Engineering, Literature Search and Review, Theories and Applications of Drug Delivery Systems, Polymer Modification, Polymer Materials, Polymer Fine Chemicals, Biodegradable Polymers, Advances in Biomaterials, Topics of Ethics in Biotechnology and Biomedical Fields, Scientific Writing & Presentation Skills, Polymerization Reaction Engineering, Composite Materials & Processing Technology, Biomedical Ceramic Materials, Introduction to Tissue Engineering, Advanced Experiments on Biomaterials etc.

**Featured courses:** six core courses include Biochemistry, Cellular and Molecular Biology, Biomedical Materials, Biomedical Engineering, Preparation and Processing of Biomaterials, Lab Training on Biomaterials. Featured main courses include Polymer Chemistry and Polymer Physics. Featured optional courses include Advances in Biomaterials, Topics of Ethics in Biotechnology and Biomedical Fields etc.

**Practice Courses:** Metalworking Practice, Cognition Practice, Advanced Practicum, Biomedical Materials Term Paper, Lab Training on Biomaterials, Biomedical Engineering Term Paper, Final Practice and Thesis Writing.

**Curriculum learning and avenues to improve comprehensive quality and ability:** General education courses, seminar courses, tutorial system (participating in teachers' research projects), Military Training, Social Practice, Practicum in Applied Software, Innovation and Entrepreneurship Course, Final Practice and Thesis Writing, scientific and technological innovation activities, Technological Innovation Project for College Students etc.