Department of Engineering and Materials Sciences

Both engineering and materials sciences necessarily and significantly underlie the importance of national security, the improvement of people's living standard, and the sustainable development of society and economy. In recent years, the progress in information technology, biotechnology, materials science and engineering, new and renewable energy technology, advanced manufacturing technology, aerospace technology and environment protection technology has provided a lot of effective technological approaches to alleviate the shortage of resources, maintain the ecological balance and keep the social, economic development and environmental tolerance in equilibrium. Aiming at frontiers and meeting the strategic demands of social and economic development as well, research in the fields of engineering and materials sciences should pay full attention to independent scientific creativity and innovation, especially original innovation and creative ideas with our own intellectual property rights. The Department will focus on developing areas such as materials science and engineering, manufacturing science and engineering, energy science and technology, resources utilization and environmental engineering, structure and civil engineering, and highlight interdisciplinary researches such as information technology, life science, nano-science and technology, space science, and disaster prevention, reduction and control. The exploration of frontiers should be integrated with national interests and the combination of basic research with engineering application will be encouraged in order to raise China's international competitiveness in science and technology and to achieve a sustainable development of the society.

The Department will continue to strengthen its support to interdisciplinary areas and the exploration of frontiers, and encourage original innovation, integrated innovation and re-innovation based on the absorption and digestion of existing knowledge, while considering the common features in the fundamental research of engineering and materials sciences. At the same time, the Department will pay attention to key scientific issues resulting from engineering application, especially those researches with such great significance that the industrial development can be promoted and international competitiveness be raised.

In 2006, the Department received 10,597 proposals of various types. Among them, 9,687 were applications for General Program (excluding Joint Funds) projects, which is an increase of 18.64% compared with that in 2005. Of the total proposals, 7,253 were submitted for Free Application projects, 2,169 for Young Scientists Fund, 265 for Fund for Less Developed Regions, 193 for Key Program, 292 for Fund for Distinguished Young Scholars, 53 for Joint Research Fund for Overseas and Hong Kong, Macao Young

Scholars, and 13 for Creative Research Groups. The Department also received 156 proposals for the Joint Research Funds and 566 proposals for some special funds.

By means of peer review and panel evaluation, 1,563 General Program projects were supported, with a total funding of 432.07 million yuan. Among them, 63 were one-year high-risk creative projects, with a total funding of 6.64 million yuan. Forty-two Key Program projects were supported with 72.94 million yuan. The average funding of General Program projects is 283, 800 yuan per project and the success rate is 16.14% (excluding projects of Small Fund for Exploratory Studies). In addition, 10 general projects and 2 key projects for NSFC-Bao Steel Joint Fund were awarded, with a total amount of 6 million yuan, 4 major projects for International Cooperation were supported, with a funding of 4 million yuan.

The number of projects for Young Scientists Fund and Fund for Less Developed Regions reached 365 and 40, with success rates of 16.83% and 15.1%, respectively, lower than the planned 18.44% and 18.87%. It indicates that applicants for these two programs need to improve the quality of their proposals, especially in terms of creativity and the demonstration of regional characteristics.

Funds and Projects for General Program in 2006

Unit: 10,000 yuan

Scientific division		Funds	Projects granted	Rate (%)++
Division I of Materials Science	Metallic materials	4,180	143+10*	17.78
Division II of Materials Science	Inorganic materials	5,383	185+9*	15.94
	Polymer materials	3,791	128+11*	16.81
Division I of Engineering Science	Metallurgy and mining science	3,825	135	15.11
Division II of Engineering Science	Mechanical engineering	8,567	302+4*	16.25
Division III of Engineering Science	Engineering thermophysics	4,001	142+10*	17.20
Division IV of Engineering Science	Civil engineering and environment	7,380	258	14..42
Division V of Engineering Science	Electrical engineering	2,644	89+9*	15.71
	Hydraulic science	3,436	118+10*	17.90
Total		43,207	1500+63*	16.14
Average intensity	27.84(28.56**)			

Note: * Number of one-year high-risk creative projects.

** Average intensity of General Program projects in three-year term, one-year high-risk creative projects are excluded.

++ One-year high-risk creative projects are included.

Attention should be paid to the following issues in 2007:

1. Proposals that meet the urgent needs of national economic construction and sustainable development of the society will be encouraged. The Department will support preferentially basic research with significant scientific merits and applicable prospects, with considerations of practical conditions and resource characteristics of China, which can either drive the development of relevant sciences or lead to independent intellectual property rights for China.

2. Interdisciplinary research will be encouraged with various disciplines at different levels, especially with life science, information technology, energy engineering and environmental science. Applicants should put forward new conceptions and ideas as creative as possible with specific scientific issues.

3. The Department will continue to maintain the higher success rate in Young Scientists Fund to encourage young researchers to put forward independent understanding in their areas, and preferentially support applications by young applicants with new ideas and good background of international cooperation.

4. With the increase of investment from the central government in science and technology, research funds in the Department will grow soundly year by year. Hopefully, the average intensity of General Program project may exceed 300,000 yuan in 2007.

5. Analysis showed that following-up and low-level applications lacking creative ideas and basic research means occupied quite a large proportion of the proposals submitted in 2006. Additionally, there were some other common problems. Some applications didn't give solid reasoning in the argument and some didn't give clear pictures on the focal points or lacked the feasibility in experimental approaches. Even worse, some applications tried to solve problems in the production, which clearly went beyond the funding scope of NSFC.

6. If applicants are not very familiar with the application codes, please contact relevant divisions in order to avoid the wrong submission of applications.

Division I of Materials Science

The Division mainly supports basic research projects on metals, alloys and metal matrix composites which deal with scientific issues in materials science and have unique research ideas so as to promote our international competitiveness or the development of relevant research disciplines based on the national demands. The Division also supports

research on those fundamental aspects in the preparation and working process of materials.

The funding scope of the Division covers such broad areas as compositions, microstructures, phases, surfaces and interfaces, scales effect, impurities and defects in metals, alloys and metal matrix composites and their influence on mechanical and physical properties and the performance of materials; basic issues in the processing of metallic materials, alloy phase diagram, phase transformation and alloy design of metallic materials; strengthening and toughening, deformation and fracture, and strength theory of metallic materials; fundamentals of energy materials, environment-friendly materials, biomaterials and recyclable metallic materials; the mechanism of interactions of metallic materials and environment, consequent failure and functional degradation and relevant fundamentals; fundamentals on computational materials science; new-type metallic functional materials and structural materials and their theoretical basis, and the development of modern analysis and test methods, principles and techniques incorporating basic and applied basic researches of metallic materials.

In 2006, the Division received 852 proposals for General Program projects, including 641 for Free Application, 180 for Young Scientists Fund and 31 for the Fund for Less Developed Regions. Plus other applications for programs such as the Steel and Iron Joint Fund, Major Research Plan, etc., the total number of proposals reached 927. Through peer review and panel evaluation, 153 General Program projects were funded, in which 119 were for Free Application, 29 for Young Scientists Fund and 5 for the Fund for Less Developed Regions. It is noticed that proposals in the areas such as nano-structured metals, amorphous alloys and functional materials occupied a larger proportion compared with other areas, and at the same time, the number of proposals kept increasing in the area of magnesium alloys. It reflects to some extent what researchers are interested in but the Division hopes that researchers should pay attention not only to the frontiers in hot areas, but also to other fundamental issues with scientific merits and ideas with creativity. In addition, some attention should be paid to the new understanding of classic issues in basic materials.

The Division will continue to support basic research with creative ideas in all aspects of the funding scope specified above. New idea, concept and vision revealing basic mechanism will be encouraged with respect to the Key Program areas supported in recent years (including the areas to be supported in 2007). The Division also encourages cross-disciplinary and multi-disciplinary research related to materials science that can promote the development and progress in the relevant areas.

The Division requires applicants and chief members of the project teams to provide specific research results obtained in their previous NSFC projects granted in recent years, publication listings in SCI, EI and national core periodicals in the past five years, citation data and their impacts. The Division will continue to prioritize those well-established research groups and institutions with good infrastructures in the field of metallic

materials science and engineering in the process of evaluation.

Division II of Materials Science

Inorganic Non-Metallic Materials Science

The Division supports both fundamental and applied researches which focus on inorganic non-metallic materials. With the development of theories of material design and synthesis technologies, many new materials have been developed, including high-T_c superconducting ceramics, smart materials, biomaterials, new energy materials, nano-materials and so on, which has greatly stimulated the researches on/into inorganic non-metallic materials. At present, in the filed of inorganic non-metallic materials, functional materials are developed to possess high efficiency, reliability and sensibility, smartness and functional integration, while engineering materials tend to possess multi-functionality, high toughness, specific strength, wear-resistance, corrosion-resistance, and high-temperature endurance, low cost and high reliability. Meanwhile, conventional materials are also being remolded and upgraded. Furthermore, inorganic non-metallic materials are playing ever-increasingly significant roles in information technologies, life science, energy and environmental science.

A review of all the related proposals submitted in the past three years indicates that researches have been broad in range and interdisciplinary in nature besides an annual increase in the number of proposals. In 2006, there were 1,217 applications for the General Program, a 20% increase compared with those submitted in 2005. However, only 15% of all the applications were funded. Of the applications, 40% were interdisciplinary ones within such areas as information technologies, physics, chemistry, life science, energy and environmental science. The proposals for research on functional materials accounted for 59.0% of the total. These proposals unfolded many innovative ideas and formed a number of hot-spots of research, such as nano-materials, functional ceramic materials, carbon and super-hard materials, photoelectric information functional materials, functional composite materials, new energy materials and biomedical materials, among which applications from photoelectric information functional materials (about 20.0% of the total) ranked above all the others. Despite marked improvement in the overall quality of applications, more efforts should be devoted to the formulation of innovative ideas. In engineering ceramics, proposals mainly came from a few research institutions (about 6.7% of the total applications), which are developing materials with higher toughness, reliability, easier processing and lower cost. Nevertheless, it has also been observed that a fairly large number of proposals simply followed and repeated previously existing researches, and that there was a lack of original ideas, unique features, fundamentality, or direct connection with inorganic nonmetallic materials.

The Division supports innovative research projects and interdisciplinary ones between inorganic non-metallic materials science and the related subjects, such as life and health

related fundamental research. It encourages researches exploring new materials, new methods, new phenomena and functions; research on the preparation and application of novel inorganic information functional materials in accordance with domestic resources; novel processing technologies, physical and chemical issues, and the characterization of their properties for low-dimensional materials and nanomaterials; research on materials featuring phase transformations induced by external fields and their applications; basic research on structural-functional integration materials; the preparation, structure, performance and their characterization of new energy materials, biomedical materials and eco-environmental materials; basic theoretical research on the design (at macro-, meso- and micro-levels, respectively) of inorganic non-metallic materials; applied research on the improvement and remolding of the conventional inorganic non-metallic materials by new theories, new technologies and processing; processing science and techniques of materials with high performance, low cost and high reliability; and eco-friendly synthesis science and technology.

Organic Polymer Materials

In the field of organic polymer materials, the Division received 827 proposals in 2006, 118 more than the figure in the previous year, which represents an increase of 16.6%. Among them, proposals for opto-electronic functional materials, functional inorganic/organic composites, polymer- based nano-composites, biomedical materials and eco-environmental polymer materials reached 48, 66, 56, 127 and 68 proposals, respectively, showing that these five areas were the hot spots. The success rate of proposals for organic polymer materials reached 16.9%. Among them the rate for Free Application was 16.8% and that for Young Scientist Fund was 18.2%.

At present, the main tasks and developing directions for organic polymer materials science are as follows: 1) For general polymer materials, the focus is on the implementation of high performance and functional properties, the relationship between machine forming and congregation state textures, and the variation of materials textures and materials properties in their utilization; 2) Functional polymer materials and organic solid functional materials; 3) For polymer-based composites, the stress is on high performance, interface, new synthesis technology, computer aided technologies and low cost technology; 4) Special polymer materials and engineering plastics, 5) Polymer materials related to environment, energy resource and resource utilization.

Basic and applied basic researches in the following fields are encouraged: general polymer materials with high performance or functional properties, functional polymer materials and organic solid functional materials, preparation science and technical processes for polymer materials (e.g. new technique and new technology for material preparation and processing, new theories of reinforcement and toughening, fatigue and fracture, friction and lubrication, structures and performance of multi-component materials in congregation state, composite materials-based matrix resin and its interface properties, and computer aided design and forming), adhesives, coatings and assistants of new organic polymers, biomedical polymer materials, organic nano-materials, intelligent

materials and bionic polymer materials, eco-environmental polymer materials including natural polymer materials, environmental friendly polymer materials and renewable polymer materials.

The Division highly encourages fountainhead innovation and promotes interdisciplinary cooperation.

Division I of Engineering Science

The Division mainly supports fundamental researches in mining and metallurgy sciences, including such main fields as resource exploitation, safety science and engineering, mineral processing and separating, metallurgical and material physical-chemistry, ferrous and nonferrous metallurgy, material preparation and fabrication, eco-environment of mining and metallurgy, resource recycling, etc.

The development trends of the discipline at present are as follows: 1) Basic research scope in the above-mentioned fields has been increasingly extended and deepened. Many researches transfer from macro, middle scope to microscope, and each couples and intercrosses with another, from raw minerals to the recycling of resource, from metal to composite materials, even functional materials. 2) Interdisciplinary differentiation and amalgamation have been strengthened. With the interdisciplinary amalgamation and differentiation with life science, informatics, mechanism, chemistry, materials science and managerial science, etc., new research fields such as resource recycling science, non-pollution process engineering, green catalyzing engineering, bio-metallurgy, environmental bio-chemical engineering, bio- and chemical mining, computing metallurgy and physical-chemical metallurgy, metallurgical informatics and electro-magnetic metallurgy have appeared. 3) Relationship between science and technology is getting increasingly closer. Equipment for mining and metallurgy, monitoring and controlling of system, metallurgical reaction engineering science and systems engineering, and metallurgical ecological technology, etc., are integrated with each other, and many new technologies, new methods and new branches of science have emerged. 4) Researches have been carried out much more quantitatively and accurately, e.g. precisely analyzing the composition of molten salts and slag, and precise control of rolling process. Many important research areas are expected to be studied deeply and systematically.

In 2006, 1,011 proposals were received by the Division, 22 % more than that of the previous year. Among which, 60% dealt with the following research fields: materials preparation and fabrication, resource exploitation, safety science and engineering, mineral engineering, resource extraction and matter separations, powder engineering and powder metallurgy.

The fields with less than 10 proposals were subterranean heat resource and exploitation,

ocean and space metallurgy, metallurgical chemistry engineering and equipments, other ways of resources utilization, underground space engineering and metallurgical reaction engineering. There were a few proposals dealing with special metallurgical methods and other new techniques, e.g., microwave, plasma, electromagnetism, laser and ultrasonic. Now the hot spots are resources exploitation, material preparation and fabrication, safety science, etc. The Division supported 135 projects in 2006 (not including projects of Key Program and joint funds), and the success rate is 15. 15%.

The Division will continuously promote interdisciplinary studies and the exploration of novel methods, encourage original ideas and innovations, and emphasize applied basic research, especially those that could enhance China's competitiveness in mining and metallurgy industry. Preferential support will be given to projects with theoretical significance, potential application, prior prospect and fundamental researches in new theory and new methods. Young scientists who have creativity, good performance and cooperation with others are encouraged. Researchers are encouraged to work systematically and consistently on a specific research field to cultivate their own features. The ideas should be described explicitly in the proposals. Applicants should pay more attention to the fundamentality, creativity, feasibility and reality, and try to avoid stressing only on the practical needs with inadequate scientific contents. Many failed in 2006 because of too short or empty contents and unsuitable form, and others failed due to over ambitious targets and simple research plans. Those applicants who have been funded before should offer the achievements and give clear indication of the papers published in recent years.

The main research areas encouraged by the Division are as follows: 1) theories and technologies on green mining and digital mine, 2) major disasters, especially the theories about mine gas explosion, self-ignition of coal and mine flood, 3) preparation, change and working of mineral materials, 4) recycling of resource, such as carbon dioxide fixation and utilization, new theories and new methodologies in metallurgical reaction engineering and its related eco-environment, and new processes of economical atom reaction, 5) metallurgical and material physical chemistry, 6) theory of metallurgy and process under extreme and special conditions, 7) metallurgical reaction engineering science, metallurgical chemical engineering process and equipments, and 8) theories on uniformity control of batch and/or ultra-size metallurgical products. More funding will be granted to projects of high cost (about 500 thousand yuan per project), such as pyrometallurgy, electrochemical-metallurgy and plastic forming of metals.

Division II of Engineering Science

The Division mainly supports basic research in the fields of mechanical science and manufacturing engineering science. Mechanical science is a basic technology science aiming at functional comprehension, quantitative description and performance control of the mechanism. Its main tasks are to study the unknown characteristics of mechanical

systems, and to develop all kinds of knowledge and performance needed by mechanical systems into new design theory. Encouragement and support will be given to creative proposals in such fields as mechanisms and robotics, mechanical transmission, mechanical dynamics, mechanical structural strength, tribology and surface technology in mechanical engineering, mechanical design theory and methodology, mechanical bionics, mcrio/nano mechanology, etc. Manufacturing engineering science is mainly to study manufacturing products which meet the design requirements, and various manufacturing systems, processes, arts and crafts, equipment and methods. It includes forming, machining, manufacturing systems and automation, mechanical metrology and measurement instruments, MEMS, and so on.

Proposals submitted to the Division in 2006 have the following features: 1) More proposals were received, reaching a total of 2,007 and an increase of 15% over that in the previous year. Among them, 1,882 were for General Program projects (1,474 for Free Application, 369 for Young Scientists Fund and 39 for the Fund for Less Developed Regions), 36 for Key Program projects, 66 for Distinguished Young Scholars and Joint Research Fund for Overseas Chinese, Hong Kong and Macao Young Scientists, 8 for Special Funds, 2 for Major Research Plan projects, 8 for Special Fund for Basic Research of Scientific Instruments, 4 for Joint Fund, and 1 for Creative Research Groups. 2) 280 institutions submitted proposals to the Division, 16.67% or 40 institutions more than that in the previous year and more than 98% proposals came from universities; 48 institutions submitted over 10 proposals each, accounting for 67% (or 1,265 proposals) of the total. On the other hand, 101 institutions submitted only one proposal each, accounting for 36% of the total number of institutions, but only 9 proposals were granted, showing that proposals from these institutions have no competitiveness. 3) Proposals for Young Scientists Fund have continuously increased at a rate of about 19%. However, not many proposals have been evaluated as excellent. In order to enhance the training of young scientists, the Division have taken some special measures to encourage young scholars and the success rate for Young Scientists Fund is higher than the average rate.

Problems existing in proposals submitted to the Division in 2006 are summarized as follows:

1) Research contents and scientific problems in some proposals did not fall into the area of mechanical engineering. For example, in mechanical structure and dynamics, some proposals mainly focused on mechanics; in mechanical tribology, many aimed at the study of materials; in bio-manufacturing, quite a number of proposals mainly studied the contents of medicine, and in mechanisms and robotics, many proposals dealt with control technologies. All of the above proposals were not suitable for submission to the Division. Applicants should select correct code (7 digits) according to their research contents. 2) Some proposals did not meet the requirement and standards. Some were lack of the explanation of research expenses and others lack of the resumes of applicants and/or main staff members. Some proposals were incomplete, or could not provide necessary attachments of the recently finished projects funded by NSFC. Evidence or arguments

used in some proposals were inadequate, descriptions of innovation were not scientific, or research contents and technology approaches were too simple. All these proposals did not pass the preliminary check. 3) In respect of the distribution of research areas, the number of proposals from mechanical dynamics and component forming is still increasing. But the number of proposals in mechanical tribology and surface technology, manufacturing systems and automation, interdisciplinary research in manufacturing engineering science remains nearly the same. Proposals in the fields of mechanisms and robotics, and mechanical transmission have increased greatly. On the other hand, quite a few proposals are just simple replication research and are lack of innovation.

In 2006, 3+X evaluation system was first used in General Program projects by the Division. In peer review, the Division adopted some policies such as equal competition, scientific democracy, stimulating innovation, boosting cooperation, etc. Some proposals which contained innovative ideas were granted. Other proposals which focused on the fundamental research of interdisciplinary areas and related to the healthcare with the background of international cooperation and exchange were also granted. Proposals with big topics and lack of research contents, objectives, examples or engineering application prospects will not be encouraged.

In 2006, the Division funded 307 General Program projects (including 236 for Free Application, 66 for Young Scientists Fund and 5 for Fund for Less Developed Regions) with a total funding of 55.67 million yuan, a success rate of 16.25% and the average funding intensity of 280.0 thousand yuan per project. Six proposals for Key Program projects were granted with a total funding of 10.20 million yuan and the average funding intensity of 1.70 million yuan per project. At the same time, the Division also funded 5 proposals for the Fund for Distinguished Young Scholars, 2 for the Joint Research Fund for Overseas, Hong Kong and Macao Young Scientists, 2 for the Special Fund for Basic Research of Scientific Instruments, one for Major International Joint Research project and one for the Joint Fund, with the funding of 10.00 million yuan, 800.00 thousand yuan, 1.80 million yuan, 1.00 million yuan and 300.00 thousand yuan, respectively. The funding in the Division exceeds 100 million yuan for the first time.

According to the tasks, plans and disciplinary development, the Division will, in 2007, strongly encourage and support creative basic research proposals in the frontier of the discipline. Natural resource and environment are two key areas related to long term and sustainable development of China. Proposals on new principles and methods, new processes and technologies on mechanical electrical systems and equipment will enjoy preferential support. Proposals for Young Scientists Fund containing innovative ideas are also welcome.

Division III of Engineering Science

The Division supports fundamental research in the field of engineering thermophysics

and energy utilization that involves in engineering thermodynamics, refrigeration and cryogenics and dynamic characteristics of thermodynamic systems, aerothermodynamics, heat and mass transfer, multi-phase flow, combustion, thermo-physical properties and measurement, renewable energy utilization and other fundamental and innovative researches related to engineering thermophysics and energy utilization.

Proposals in recent years demonstrate that research in the fields of engineering thermophysics and energy utilization is very active. The research contents have gone deeper, research objectives more extensive and research achievements for wider applications. In 2005, the Division funded 140 General Program projects (including 10 projects of Small Fund for Exploratory Studies) with the approval rate of 19.05%. In 2006, the Division received 884 proposals for General Program projects, with an increase of 20.3% (149 proposals more) compared to that in 2005, and the number of proposals remarkably increased in the areas of combustion and combustion pollutant generation and control, multi-phase flow and phase transformation, renewable energy utilization, etc. The Division funded 152 General Program projects (including 10 for Small Fund for Exploratory Studies) with an approval rate of 17.2%.

The main development trends of the discipline are as follows. 1) Research on the basic issues has gone from macro-level to meso-level and micro-level, from isolated studies to coupled studies, from common parameters to parameters under ultra- or extreme conditions, from routine thermophysical problems to random, unsteady, multi-dimension, multi-phase and complicated thermophysical problems and intercrossing research in the discipline. Moreover, research becomes more quantitative and precise. 2) Research has crossed traditional disciplinary borders and formed interdisciplinary projects with related disciplines (e.g. with physics, chemistry, life science, information science, materials science, environment and safety). Creative researches in the following areas are encouraged: mechanism of new type thermodynamic cycles and non-equilibrium thermal dynamics, dynamics, optimization and control of complicated systems, turbulence properties of internal flows and properties and control of unsteady flows, porous media and micro-scale heat and mass transfer, radiation and heat exchange by phase transformation, clean, supersonic and micro-scale combustion, thermophysical problems in the prevention of disasters, mechanism of interaction between phases and thermophysical model in multi-phase flow, new principles and methods in thermophysical measurement, and new thermophysical principles in renewable energy transformation and utilization.

The Division requires that applicants provide detailed information on research achievements obtained in all NSFC previous projects and the list of papers published on international and domestic journals in recent years. All the information provided must be impersonal and true, or it will directly affect the evaluation and approval of the applications.

Division IV of Engineering Science

The Division's funding scope mainly covers architecture, environmental engineering and civil engineering. The development trends of architecture are research on the development of region, city and building, the innovation of construction techniques from the viewpoint of human-environment relationship, and research on basic theory and methods of planning and design based on sustainable development strategy. The emphasis of environmental engineering research is on water or air pollution control and quality amelioration, as well as theories and methods for the treatment, resourcelization and harmlessization disposal of various pollutants and wastes. Civil engineering stresses that studies should be closely combined with engineering practice to investigate basic theoretical issues and solve foresight key technological problems arising in engineering construction. The interdisciplinary interaction, the application of advanced experiment and information technologies and the adoption of new materials, new structures and new technologies are the major features in the development of these research fields.

In architecture, focus should be given to new science problems arising in urban construction, exploration and application of new technologies and new methods. Research on environmental engineering emphasizes key scientific issues related to new theories and technical bases of new high-efficiency and low-consumption technologies, which includes water purification, wastewater treatment and utilization, municipal water supply and drainage system, urban refuse disposal and utilization, air pollution cleaning, and control and renovation of the polluted water environment. Other research subjects related to environmental science should be submitted to other relevant divisions. In civil engineering, more attention should be paid to innovative research on the analysis, design and reliability of the complex structure. Key scientific problems on the following topics are encouraged: intelligent structural systems and performance design theories in civil engineering, disaster effect, failure mechanism and performance control of civil infrastructure and structures, new structure systems and constructing technology, modern structure experiment, on-spot measurement and digital simulation technology, and health diagnosis and renovation of structures. Research on structural disaster-resistance on the level of overall structural system should be strengthened, and efforts be made to improve the innovativeness and practicality in the study of seismic-resistant and wind-resistant engineering structures. In the area of geo-technical engineering, researchers should focus their attention on the engineering properties of soil under complex conditions, and invalidation mechanism and control methods of geotechnical engineering. In traffic engineering, the emphasis is on the research of planning theory and key construction technology in traffic infrastructure. The strategic report of the Division in the Eleventh Five-Year Plan was published by the Science Publishing House in 2006. The document, which reflects the ideas and thoughts contributed by hundreds of experts, is of important significance as guidance and reference for applicants to write proposals.

Division V of Engineering Science

The Division is mainly responsible for funding projects in hydro sciences and water management, hydraulic engineering and ocean engineering, and electrical sciences and engineering.

Hydro Science and Engineering

In hydro science and engineering (which consists of hydro science and water management, and hydraulic engineering and ocean engineering), 715 proposals were received in 2006 for General Program projects, in which 512 proposals were for Free Application, 169 for Young Scientists Fund and 34 for the Fund for Less developed Regions, which is an increase of 13% compared with that in 2005, but much lower than the average 20% of the Department. Among the proposals, 337 fell in the area of hydro science and water management, and 378 in hydraulic engineering and ocean engineering. Proposals for hydraulic and marine structures, soil and rock mechanics and engineering, hydrology and water resources, irrigation and water-soil engineering reached 130, 122, 109 and 97, respectively, representing a large proportion of total proposals. However, proposals for hydraulic materials and hydraulic machinery were only 20 and 31, respectively, representing a small proportion. Proposals in other fields such as environmental hydraulics and water environmental engineering, hydraulics, and hydrodynamics and sediment transportation remained almost the same as that in 2005. The number of institutions that submitted proposals in 2006 were 152, which increased by 18% compared with that in 2005. Two institutions submitted more than 50 proposals, ten submitted more than 10 proposals and 79 submitted only one proposal each. In 2006,128 projects got funded, including 10 projects of Small Fund for Exploratory Studies, accounting for 17.9% of the proposals, with an average funding of 280,000 yuan. Among proposals for Free Application, 89 were funded and the success rate is 17.4%; 32 proposals for Young Scientists Fund were funded and the success rate is 18.9%; and 7 proposals for the Fund for Less Developed Regions were funded and the success rate is 20.6%. A large proportion of the projects belong to multidisciplinary research or research conducted by applicants who successfully completed their previous projects. Projects in newly immerged research fields or having obvious creativity are not enough.

Hydro science and engineering shows the following main trends: 1) Multidisciplinary methods are used to solve practical and urgent water related issues in hydraulic engineering, ocean engineering, agricultural engineering and ecological and environmental engineering. 2) The frontiers in hydrology and water resource management are flooding and drought disasters control, flooding water resource uses, centralized management of river basins, water/eco-system/economy complex systems analysis, the impact of human activities and climate changes. Watershed environment protection and water pollution control of the rivers and offshore areas, especially the mechanism of agricultural pollution and urban pollution in bay areas, are still the research focuses. Drinking water safety, ecological water utilization, eco-hydraulics and

eco-environmental water management become new growth points. 3) Because of the construction of major engineering projects, such as marine exploitation, transmitting electric power from the west to the east of China and diverting river water from the south to the north, extensive studies have been conducted on structure engineering, geotechnical engineering, hydraulic and ocean engineering, especially on the mechanical properties and damage mechanism of the complex structures, ground waters and their foundations. Moreover, research on new methodologies of disaster prevention and relief has been greatly advanced. 4) Research on sediment movement and disaster has become the main stream in sedimentation. However, exploratory research on silt resources and environment is still at the initial stage. Irrigation and water saving technology, and alkali soil improvement and use are key research areas. 5) Hydraulics, hydraulic materials and hydraulic machinery also attract relative interests.

The followings are the priority research areas: disaster mechanism of rock-soils and hydraulic structures system, methods of disaster prevention and relief in hydraulic and ocean engineering; deformation and strength behaviors of rock and soils under complex situations, mechanism of strengthening rocks and soils with anchors; key issues related to super-high dam projects; theory and methods to design deep harbors and ocean structures; irrigation technology of water saving, environment protection and efficiency improvement of water use; methods for recovering polluted watershed, interaction between sediment and pollution; eco-environmental water management, impact of major dam projects on the eco-environment, the sustainable utilization and management of water resources; and hydro-informatics, and finally hydraulic machinery.

Electrical Engineering

In the field of electrical engineering, among the 624 proposals submitted for General Program projects in 2006, 98 (or 15.71%) were approved. Detailed statistics are listed below: 73 out of 460 proposals submitted for Free Application were funded, figures for Young Scientists Fund and Fund for Less Developed Region were 23 out of 151 and 2 out of 13, respectively. Figures showed that proposals received for the above three General Program categories increased by 21%, 54% and 18% over that in the previous year, respectively. The success rates were 3.8% and 5.2% lower than those in 2005 for Free Application and Young Scientists Fund, while 8.9% higher for the Fund for Less Developed Region. The figures reflected the funded decrement of 2 projects for Free Application, increment of 3 projects for Young Scientists Fund and increment of 1 project for Less Developed Region Fund. With regard to the research fields that the General Program funded, those in electromagnetic fields and circuit theory accounted for 5.1%, electric machine and systems 17.3%, power systems 29.6%, high voltage and insulation technologies, apparatus and electromagnetic materials 20.4%, power electronics 13.3%, and pulsed power and discharged plasma technologies 5.1%. Two General Program projects were approved as part of the Major Research Plan, with the success rate of 10%.

From 2004 to 2006, the Division approved, in the field of electrical engineering, 274 General Program projects and 10 Key Program projects. Among the General Program

projects approved, those in electromagnetic field and circuit theory accounted for 6.6%, electric machine and systems 15.3%, power systems 26.6%, high voltage and insulation technologies, apparatus and electromagnetic materials 22.3%, power electronics 11.7%, pulsed power and discharged plasma technologies 5.5%, and bio-electromagnetic technologies 3.6%.

The deficiencies in some applications last year are listed below. Some applications were vague, too general and devoid of innovative ideas. Some tried to cover too many topics but failed to address or focus on key issues. Still others tended to oversimplify the statements of research contents or the approach of their work. There were even proposals not related to electrical engineering.

Applicants are requested to submit high quality proposals. Proposals should address the motive and main features of the research in detail, and highlight the key points. All the applicants should verify the application code, and submit their proposals accordingly.

The focus of electrical engineering research in recent years is on the following fields: electromagnetic actuators based on new functional materials, renewable energy power generation and systems, electrical energy storage/release and electrical energy saving, integration of electrical energy conversion systems, high voltage and great capacitance power electronic systems, power electronic integration, electrical energy quality, multi-time-scale simulation of power systems, safe operation/control/protection of large scale inter-connected power systems and the correlative IT, distributed electrical power systems, composite structure characteristic and service performance of micro/nano dielectric materials, insulation materials and structures for high voltage, extra/ultra-high voltage electrical power transmission technologies under complicated conditions, devices for ultra-fast and ultra-short pulsed power and their combination, electromagnetic technologies in medicine, high-temperature superconducting technologies, gas discharge in various modalities and conditions, basic issues of glow discharge plasma technologies, electromagnetic compatibility issues of electrical equipments and micro-electronic systems, sensing and treatment of special and important electrical engineering signals or deep-seated biologic signals.

The Division encourages applicants to give full play to their creativity and originality, and explore various research fields and levels based on thorough understanding of the trends of world science and technologies, and the absorption of achievements and experiences of all disciplines. Also, we promote domestic based researches. With regard to the fields of electric power science, investigations in theories and technologies of high efficient, flexible, safe, reliable and environmental friendly conversion, transmission and utilization of electric power related to the national demands of energy development are encouraged. These include high efficient energy conversion under extreme conditions, high efficient and safe operation of complicated power systems and equipment, power electronic converters and integration, and superconducting electrical technologies. As to the fields of electromagnetic field and the interaction between electromagnetism and

matter, the exploration of new phenomena, investigations of new principles, models and applications related to high technologies and demands of national defense are encouraged. These include rules of electrical insulation under complicated conditions, micro-structure and performance of dielectric nano-composite, time and space compressively transmission of electromagnetic energy, coupling between electromagnetic pulsed energy and its applied objects, discharge and high active plasma generation under extraordinary or extreme conditions, interaction between electromagnetism and matter, sensing, processing and utilization of inherent and induced biologic signals, and large scale and complicated transient electromagnetic fields.

Any innovation of methodology and approaches is encouraged. Applicants should attach great importance to the measurement/test principle and methodology of electromagnetic parameters/characteristics, and the application of information technologies to the measurement/test. Most importantly, they should put stress on the qualification and verification of experimental results to ensure that research results are both scientific and verifiable.