# PART VI

# Completion and Evaluation of NSFC Projects

## 6.1 Completion of General Program Projects

**Statistics of General Program Projects Completed and Achievements Obtained in 2007**

Table 6-1

| | | | | |
|---|---|---|---|---|
| **Projects completed** | | | | **6,311** |
| **Achievements** | **Papers and publications** | **Invited speakers** | International conferences | 8,866 |
| | | | Domestic conferences | 8,874 |
| | | **Papers and books** | International journals | 20,121 |
| | | | Domestic journals | 25,385 |
| | | | Books | 3,120 |
| | **Research results** | | Evaluated | 325 |
| | | | Patents | 1,417 |
| | | | Results disseminated | 398 |
| | **Awards** | | International awards | 64 |
| | | | National awards | 81 |
| | | | Ministerial or provincial awards | 595 |
| **Talents fostered** | | | Post-doc | 1,368 |
| | | | Ph.D. | 14,478 |
| | | | Master | 23,513 |

## 6.2 Completion of General Program Projects

**Statistics of General Program Projects Completed and Achievements Obtained in 2007**

Table 6-2

| | | | | |
|---|---|---|---|---|
| **Projects completed** | | | | 185 |
| **Achievements** | **Papers and publications** | **Invited speakers** | International conferences | 1,231 |
| | | | Domestic conferences | 922 |
| | | **Papers and books** | International journals | 3,289 |
| | | | Domestic journals | 3,107 |
| | | | Books | 266 |
| | **Research results** | | Evaluated | 8 |
| | | | Patents | 335 |
| | | | Results disseminated | 36 |
| | **Awards** | | International awards | 19 |
| | | | National awards | 30 |
| | | | Ministerial or provincial awards | 87 |
| **Talents fostered** | | | Post-doc | 255 |
| | | | Ph. D. | 2,245 |
| | | | Masters | 1,613 |

## 6.3 Evaluation and Acceptance of Major Program Projects

In 2007, 7 Major Program projects were evaluated and completed.

In the project "Searching unknown heavy mass particles in cosmic rays", the main objective is to search for new particles that are not included in the standard models. Through newly completed hardware and facilities, researchers achieved main physical objectives such as acquiring upper limit value of flux with 90% of confidence level in searching quasi-Kolar case and high precision atmospheric muon differential momentum spectrum in 20-3000 GeV energy region and angle distribution within 60° zenith, etc; conducted research on high energy particle radiation behind sola flare and searching of TeV flare variation, etc., conducted research, development and assembly of 154m$^2$ scintillator detector (3/4 of the scintillator detector) by using the largest and most accurate magnetic spectrometer in the world, and established the software working environment in CERN.

Researchers for the "Research and development of electromagnetic calorimeter on Alfa magnetic spectrometer (AMS-02)" developed electromagnetic calorimeter (key sub-detector in AMS) according to the requirement in space lab, which gives good ability of detecting GeV-TeV positrons and electrons and 300GeV-2TeV $\gamma$ -ray, completed beam test and data analysis, and achieved creative results in space structural design, finite element analysis, environmental simulation test, space manufacture and new materials.

Researchers for the "Studies on several scientific problems in chirality and chiral drug research" designed and synthesized a class I new thiophosphonamide chiral ligand and class I new L-proliamide organic catalyst, studied systematically [2,3] $\sigma$ transfer reaction generated by allyl (propargyl) sulfide with metal carbene participation, realized chiral sulfide compound of high enantio-selectivity; studied the synthesis of catalyst by chiral small molecular ligand on dendrimers and their functions in reactions such as double bond asymmetric hydrogenation, synthesized class I new core-shell structure dendrimers catalyst, and developed effective

method of catalyst separation and recycles. They also established for the first time the system for micro aqueous reaction of cyanohydrin enzymes, obtained several optical active cyanohydrin compound, synthesized some important drug molecules and physiological active molecules by bio catalysts, and laid the foundation for further exploration of more selective nerve drugs for systematic research on compound isomers as pre-research on drugs.

Researchers for the "Basic research on nitrogen behavior and highly efficient utilization of hydrogen fertilizers in major field ecological systems" made quantitative assessments on the relations between the movement of hydrogen in fertilizers in crop (wheat, corn and rice) soil systems in north China plateau and Taihu region and the amount of hydrogen application, and proved that hydrogen from the environment in the two regions can reach about half of the natural hydrogen supply in the field. They proposed and assessed the principles for hydrogen application, i.e., integration of regional macro control and field micro control, determined proper hydrogen application amount for the current production state, and set up hydrogen management system at county level based on GIS and empirical models. In the research on the physiologic and genetic mechanism of effective use of nitrogen fertilizer, they revealed biological properties and physiological mechanism of wheat and corn root in the whole growth period, located the main effective QTLs controlling nitrogen efficiency and properties related to the root growth, and cloned the nitrate and ammonium transfer protein gene (AMT1.1 and NRT2.1) of rice, wheat and corns.

Researchers for the "Fine map of rice genome" completed the "fine map" of Indica rice and Japonica rice, and, on the basis of rice "fine map", developed 2 sub species level total genome assembly software Reps (II), accurately marked repeated sequence in the genome, and further developed new gene prediction software (BGI Gene-Finder). Based on the result of genetic marking, they designed and developed total rice genetic chips, discovered 1.5 million SNP in different types of rice, and explored the molecular basis on the multiplication of evolution genes and molecular mechanism of high quality and productivity rice.

Researchers for the "Geophysical theory of continental oil deposit and 3-d geological mapping methods" studied the tectonic, sequence, deposit and volcanic activities in continental rift basin, set up the geological-geophysical model, logical relation and digital description of temporal and spatial configuration of the deposit, developed theoretical methods and key technologies such as amplitude-preserving pre-earthquake imaging, speed modeling of depth domain by focus estimation, generalized S-transformation, inversion of wave impedance, etc. They improved the theory and application of geological profile logging methods for volcanic rocks, introduced cluster parallel computer techniques, and integrated deposit geophysical software and technology systems.

Researchers for the "Studies on important scientific problems in advanced electronic manufacture technology" proposed a method for grinding with single wear particle of nano level with controllable scratch depth and length, developed critical cutting depth model of grinding wheels for silicon chip self-spinning grinding and the standard for controllable length single wear particle grinding, obtained several key technologies and equipment for 300 mm silicon chip grinding and chemical mechanical polish, revealed technical laws for super high precision polishing of computer disc and magnetic head, established magnetic filtering cathodic arc plasma deposition, and prepared 2 nm super thin diamond like carbon film. They revealed wideband multi-mode composite movement characteristics of high acceleration motion systems, proposed new motion control algorithms such as fiction compensation, interference observation and repeated learning, etc. clarified the mechanism of fast atomic diffusion and binding strength on supersonic binding surface, studied the effect of multiple parameters in the binding process on the microstructure of binding surface and strength, revealed motion transfer on the binding surface and supersonic energy transfer channel, developed thermo supersonic reverse chip assembly binder and frequency tracking and power adaptive supersonic generation and energy conversion system, and achieved multiple point reverse chip assembly binding of high binding strength.

Researchers for the "Studies on the chemistry and physics in reaction manufacturing process of polymer materials" designed screw element and extruder for reaction extrusion polymerization, set up a segmented bulk polyolefin production line which has independent

intellectual property rights, revealed the mechanism, history and dynamic properties of the grafting function of polyolefin reaction extrusion, clarified the mechanism of capacity expansion, the laws of formation and evolution of morphology, the relation between techniques of processing, morphology and property *in in-situ* reaction of polyolefin/polyamide, polyolefin/polyester, polystyrene/polyethylene alloyed, further solved the bottle neck problem in material R&D, and obtained a series of functional polyolefin and alloyed materials. They made systematic studies on the effect of chemical degradation, mechanical degradation and thermal degradation on the flow rate, crystallization morphology and performance of polyolefin and its alloy, and developed spinning techniques for high performance polypropylene fiber, polyolefin alloy fiber. By using Monte Carlo simulation and NMR experiment, they studied maleic anhydride grafting polyolefin reaction process, clarified long-existed disputes on the mechanism of maleic anhydride grafting polyolefin reaction, set up visualized extrusion reactor, online sampling, and optical scattering online acquisition and analysis system, studied polymer interface reaction dynamics, and revealed the relationship between polymer/polymer interface reaction dynamics and the interface property, morphology and property of the mixture.

**Evaluation of Major Program Projects in the Ninth and Tenth Five-Year Plan Periods in 2007**

Table 6-3 (Unit:10,000 yuan)

| Project title | Funding | Papers and books | | | Awards | | | Patents | Results disseminated | Talents fostered | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | International journals | Domestic journals | Books | National | Ministerial or provincial | International | | | Post-doc | Ph.D. | Masters |
| Searching unknown heavy mass particles in cosmic rays | 415 | | | | | | | | | | 9 | 2 |
| Research and development of electromagnetic calorimeter on Alfa magnetic spectrometer (AMS-02) | 415 | 6 | 7 | | | | | | | 2 | 7 | 1 |
| Studies on several scientific problems in chirality and chiral drug research | 900 | 456 | 62 | | | | | | | 3 | 56 | 34 |
| Basic research on nitrogen behavior and highly efficient utilization of hydrogen fertilizers in major field ecological systems | 800 | 11 | 19 | 8 | | | | 18 | | | 4 | 7 |
| The fine map of rice genome | 500 | 12 | 1 | | | | 1 | 1 | | | 1 | |
| Geophysical theory of continental oil deposit and 3-d geological mapping methods | 500 | 54 | 39 | 12 | | | | 3 | 1 | 10 | 110 | 116 |
| Studies on important scientific problems in advanced electronic manufacture technology | 800 | 113 | 185 | 3 | | 1 | 1 | 12 | | 12 | 50 | 125 |
| Studies on the chemistry and physics in reaction manufacturing process of polymer materials | 800 | 188 | 66 | 5 | | | | 11 | 7 | 3 | 61 | 64 |

## 6.4 NSFC's Support to the Winners of the National Natural Science Award

Min Enze, Member of the Chinese Academy of Sciences, Member of the Chinese Academy of Engineering and researcher in the Research Institute of Petroleum Processing of China Petroleum & Chemical Corporation, Wu Zhengyi, Member of the Chinese Academy of Sciences, Honorable Director of CAS Kunimng Institute of Botany were awarded the National Supreme S&T Prize in 2008. Min Enze and Wu Zhengyi have both been PI's of NSFC's projects.

Min Enze, principal investigator of NSFC's Major Program project "Environmental friendly petrochemical catalyst chemistry and chemical reactions" with a funding of 10 million yuan (of which half is from China Petroleum & Chemical Corporation) from Jan. 1997 to Dec. 2000.

Wu Zhengyi, one of the principal investigators of NSFC's major program projects of the Eighth-Five Plan period *Fauna Sinica, Flora Republicae Popularis Sinicae* and *Flora Bryophytarum Sinicorum*, and one of the principal members participated in the Major Program project of the Ninth-Five Year Plan and Tenth-Five Year Plan periods for the compilation of the Fauna Sinica, *Flora Republicae Popularis Sinicae* and *Flora Bryophytarum Sinicorum.* In addition, he undertook a Key Program project "Major feature components, formation and development of important groups in south east Asian plant system" with the funding of 1 million yuan from Jan. 2000 to Dec. 2002, 2 General Program projects and 1 Department Director's Fund project.

The first class prize of 2007 National Natural Science Award was vacant, and 39 projects were given second class prizes. Among them, prize winners of 38 projects received supports to various extents from NSFC.

**Second Class Prizes of the National Natural Science Award**

Table 6-4

| | Project title | Principal investigators | Recommendation | Titles of NSFC projects | Number of NSFC grants |
|---|---|---|---|---|---|
| 1 | Basic research and numerical simulation of discrete multi phase turbulent flow and turbulent combustion | Zhou Lixing | Expert recommendation | Second order matrix probability theory and experimental studies on gas, liquid and solid multi phase turbulent flows | 4 |
| 2 | Complex geometry about symmetric and homogeneous space | Mo Yiming | Expert recommendation | -- | -- |
| 3 | Base ring of double sided cell of affine Weyl group and expression of affine Hecke algebra | Xi Nanhua | Chinese Academy of Sciences | Algebra | 2 |
| 4 | Fracture of piezoelectric materials | Zhang Tongyi, Gao Cunfa, Zhao Minggao, Dong Ping | Hong Kong Special Administrative Region | Defect discharge phenomena in piezoelectric materials and studies on its effect | 2 |
| 5 | Research on quasi one-dimensional semiconductor nano structures and physics | Yu Dapeng, Feng Sunqi, Xu Jun, Xue Zengquan, Xi Zhonghe | Ministry of Education | Research on field emission electronic properties and emission mechanism of quasi one-dimensional functional nano linear structure | 17 |
| 6 | Experimental studies on the synthesis of new nuclide near drip line and nuclear structure in medium weight neutron deficit regions | Xu Shuwei, Zhang Yuhu, Zhou Xiaohong Li Zhankui, Xie Yuanxiang | Chinese Academy of Sciences | Beta delayed proton decay of even Z nucleus proton drip-line in near rare-earth region | 18 |

Table 6-4

| | Project title | Principal investigators | Recommendation | Titles of NSFC projects | Number of NSFC grants |
|---|---|---|---|---|---|
| 7 | Studies on several problems of crystal growth mechanism and dynamics | Wang Mu, Min Naiben | Ministry of Education | Studies on self organized growth mechanism during electro-crystallization | 9 |
| 8 | Luminescence and physical mechanism of nano silicon/nano silica systems | Qin Guogang, RanGuangzhao, Qin Guoyi, Xu Dongsheng, Zhang Borui | Ministry of Education | Silicon based electroluminescence and laser | 26 |
| 9 | New photo-electric functional molecular materials and related devices | Zhu Daoben, Liu Yunqi, Yu Gui, Tang Benzhong, Bai Fenglian | Chinese Academy of Sciences | Basic research on molecular field effect semiconductor and its circuits | 27 |
| 10 | Basic research on controlled synthesis of complexes and crystal engineering methods | Chen Xiaoming, Tong Mingliang, Zhang Jiepeng, Huang Xiaochun, Zhang Xianming | Ministry of Education | Studies on controlled synthesis, structure regulation and performance of inorganic/organic hybrid materials | 11 |
| 11 | Studies on functional electrode interface: from chemical modification to self assembly | Dong Shaojun | Chinese Academy of Sciences | Ordered assembly of single and multi molecular film on carbon electrode | 15 |
| 12 | Studies on functional interface modification and electrochemical analysis methods | Chen Hongyuan, Xu Jingjuan | Ministry of Education | Studies on the synthesis, assembly and bionic interface building of functional nano materials | 20 |
| 13 | STM studies on molecular assembly and regulation on solid liquid interface and electrochemistry | Wan Lijun, Xu Qingmin, Pan Gebo, Gong Jianru | Chinese Academy of Sciences | STM studies on surface assembly, in-situ coordination and single molecule property of complex molecules | 3 |
| 14 | Studies on the reaction, synthesis and properties of some amino acid derivatives | Ma Dawei, Zou Bin, Zhu Wei, Yu Shouyun, Cai Qian | Shanghai Municipality | chemical biological guided organic synthesis | 20 |
| 15 | Studies on Rehe vertebrate groups | Zhou Zhonghe, Xu Xing, Wang Yuanqing, Zhang Fucheng, Wang Xiaolin, Hu Yaoming, Wang Yuan | Chinese Academy of Sciences | Studies on Rehe biological groups | 25 |
| 16 | Interactions between ocean, land and atmosphere and their effect on subtropical high and climate of China | Wu Guoxiong, Liu Yimin, Li Jianping, Yu Rucong, Zhou Tianjun | Chinese Academy of Sciences | Variation of summer subtropical high and the mechanism of causing climate anomaly | 33 |
| 17 | The late quaternary climate and environmental changes on the edges of northwest China monsoon | Chen Fahu, Li Jijun, Zhang Hucai, | Ministry of Education | Studies on environmental changes and surface process in Qinghai-Tibetan Plateau and arid regions in middle Asia | 39 |

Table 6-4

| | Project title | Principal investigators | Recommendation | Titles of NSFC projects | Number of NSFC grants |
|---|---|---|---|---|---|
| | | Fang Xiaomin, Fan Baotian | | | |
| 18 | Uncertainty principles in geo-space data and space analysis | Shi Wenzhong, Tong Xiaohua, Zhu Changqing, Wang Xinzhou | CAST | Uncertainty analysis and optimal processing methods for GIS data merging in multi scale environment | 9 |
| 19 | Studies on the composition of continental crust in north China and neighboring regions and dynamics of crust and mantel interchange | Gao Shan, Jin Zhenmin, Zhang Junfeng, Liu Yongsheng, Zhang Hongfei | Hubei Province | Formation and evolution of mesozoic-cenozoic crust in north China craton and neighboring regions | 26 |
| 20 | Dialog between G protein coupled receptor signal and other cellular signal channels | Pei Gang, Ma Lan, ao Hua, Cheng Zhijie, Jing Qing | Shanghai Municipality | Cell signal transduction and feedback regulation | 14 |
| 21 | Studies on myxomycetes represented group systems | Li Yu, Wang Qi, Chen Shuanglin, Li Huizhong, Liu Shuyan | Jilin Province | Studies on important myxomycetes classification unit biology and molecular systematic meaning | 13 |
| 22 | Studies on new snoRNA structures and functions | Qu Lianghu, Zhou Hui, Chen Yueqin | Guangdong Province | Studies on the function and regulation of new RNA genes | 19 |
| 23 | Sequencing and functional analysis of the 4$^{th}$ rice chromosome | Han Bin, Feng Qi, Zhang Yujun, Wang Shengyue, Xue Yongbiao | Shanghai Municipality | Plant genetics | 3 |
| 24 | Molecular mechanism of phanerogam self-incompatibility | Xue Yongbiao, Zhang Yansheng, Lai Zhao, Qiao Hong, Zhou Junli | Chinese Academy of Sciences | Molecular genetic analysis of self-incompatibility of antirrhinum majus | 2 |
| 25 | Studies on heterocyst differentiation and ring-type photosynthetic electron transport of cyanobacteria | Zhao Jindong, Shi Yunming, Zhao Weixing, Zhao Yinhong | Ministry of Education | Studies on heterocyst differentiation and mechanism of pattern formation of cyanobacteria | 6 |
| 26 | Studies on polymorphism of Y chromosome and origin, migration and genetic structures of east Asia population | Jin Li, Su Bing,Lu Daru, Zhu Jiayou, Huang Wei | Shanghai Municipality | Studies on the comparisons of prefrontal cortex gene expression profiles of human and non-human primatesand genetic mechanism of anthropogenesis | 14 |
| 27 | Studies on target dynamic behavior of important pharmaceutical functions and functional relations and its drug design | Jiang Hualiang, Shen Jianhua, Shen Xu, Luo Xiaomin, Liu Hong | Shanghai Municipality | Dynamic modeling and drug design of disease related bio molecular identification | 23 |
| 28 | Studies on antigen presentation of cancer cell and bio regulation mechanism | Guo Yajun | Expert recommendation | Preparation and antitumor function of human phage antibodies with new specificity of liver cancer | 6 |

Table 6-4

| | Project title | Principal investigators | Recommendation | Titles of NSFC projects | Number of NSFC grants |
|---|---|---|---|---|---|
| 29 | Research and development of nano cold cathode and its devices | Xu Ningsheng, Chen Jun, Deng Shaozhi, Li Zhibing, She Juncong | Guangdong Province | Research and development and applied research on large area cold cathode electron emission materials | 28 |
| 30 | Studies on the basic theory of data modeling based on cognitive and non-Euclidian framework | Xu Zongben, Liang Yi, Zhang Jiangshe, Peng Jigen, Ma Jianghong | Ministry of Education | Comparison studies on different modeling methods of neural network and its unified theory | 12 |
| 31 | Studies on the growth of ZnO based materials, P type mixing and room temperature electroluminescence | Ye Zhizhen, Wu Huizhen, Lu Jianguo, Zhu Liping, Huang Jingyun | Zhejiang Province | Stable and high quality controlled growth of P type ZnO and homogenous ZnO-LED electroluminescence | 12 |
| 32 | Studies on intelligent control theory and methods | Wang Feiyue | Chinese Academy of Sciences | Intelligent control theory | 9 |
| 33 | Studies on osteo inductivity and its mechanism of CA-P bio-materials | Zhang Xingdong, Yuan Huipin, Fan Hongsong, Zhang Cong, Qu Shuxin | Sichuan Province | Basic research on osteo inductivity materials: structure formation and functions of bone-like apatite interface | 6 |
| 34 | Organic florescent functional materials | Tian He, Wang Qiaochun, Zhu Weihong | Shanghai Municipality | Mechanism of photo thermo stability of functional organic pigment | 20 |
| 35 | Studies on gas liquid two phase and multi phase flow and heat transfer under complex constrain conditions | Guo Liejin, Chen Xuejun, Zhao Liang, Hao Xiaohong, He Yinnian | Ministry of Education | Nonlinear multi-phase interface dynamics and energy transport mechanism and mathematical modeling | 32 |
| 36 | Studies on surface morphology and mechanical behaviors of broken rocks | Xie Heping, Zhou Hongwei, Ju Yang, Wang Jin'an, Gao Feng | Ministry of Education | Generation and simulation of joint fault morphology in rocks | 12 |
| 37 | Basic research on nano and micro scale flow and heat and mass transfer | Zheng Ping, Wu Huiying | Shanghai Municipality | Studies on micro/nano scale flow and heat and mass transfer | 2 |
| 38 | Studies on the theory and methods of stability control and intelligent optimization of complex nonlinear electric power systems | Cao Yijia, Ye Xudong, Han Zhenxiang, Gan Deqiang, Jiang Quanyuan | Ministry of Education | Studies on fast, practical parallel evolutionary algorithm for optimization and control of large complex systems | 11 |
| 39 | Studies on transport process of pollutant under different hydrodynamic conditions and system coupling models | Wang Chao, Shen Yongming, Li Ling, Lu Guanghua, Wang Peifang | Ministry of Education | Laws of hydraulic engineering projects affecting the purification capability of water ecological system and theory of recovery | 9 |