University, and Prof. Zhouzhi Zhang from Tianjin University of Science and Technology, in a research of DNA nucleus enzyme, and successfully developed a new type of "DNA logic switch". Although DNA computing has an eminent potential, current technical bottlenecks still exist. Among them, DNA molecular logic switch is a basis for DNA computing.

DNA computing was a new cross-disciplinary subject developed from soil of computer science and molecular biology. Because of enormous potential in paralleled computation and super-storage capacity of DNA molecules, DNA computing can solve intricate problems that cannot be handled by traditional electronic computers. Its application could extend to in vivo medicine transportation and genetic analysis. DNA nucleus enzyme is a nucleic acid holding specific enzymic activity. Their research work was based on nucleus enzyme that had hydrolytic enzyme activity. This sort of nucleus enzyme has a hammerhead structure, and under the catalysis of ion Cu, it could be oxidized. DNA switch was just developed through modular design based on this structure. When input bio-signals were transferred by specific biomolecules, corresponding output signals were generated. Thus, "YES" or "NOT" logic was generated. Combinations of these logic switches were further generated. These combinations, like "NOT" and "AND(A, NOT(B), NOT(C))" etc., formed a set of logic algebras, so, theoretically, all the computations on Turing machine could be realized. A unique feature of this logic switching system was that it excluded participant of RNA nucleoside used in traditional DNA logic design, and only used DNA molecules. This avoided system instability produced by RNA nucleoside. Their achievement was published at Angew. Chem. Int. Ed., 2006, 45, 1759.

Progress of Soil Research in China

Keywords: soil classification

Soil, as a survival natural resource for the existent of human beings, is always highly concerned by contemporary scientists. Being a tag to symbolize the development level of soil science, research in soil classification is a focus in today's international soil science. In demand by development of China's science and economy, NSFC has supported 3 Major Program projects as well as 3 General Program projects in this area since 1986. Under direction of science foundation, more than 200 scientists from 37 various universities and institutes endeavored for 20 years in the establishment of Chinese Soil Taxonomy and its diagnostic systems.

A classified systematical view of soil is the basis for soil management. Since soil is always one of the key environmental factors, so, to deepen our knowledge of soil properties will significantly advance our acquaintance and interpretation of this earth facial system. China has a complicated natural environment with various climate styles, abundant soil resources, and complicated soil distribution. Because of unique soil genetic pecularities in China, currently, there was not such a matching soil classification system could cover all of its features satisfactorily. Thus, to develop a soil classification system tailored to Chinese circumstances is imperative. In their 20-year research effort, system engineering - "Chinese Soil Taxonomy" was well established.

This project constructed a series of new diagnostic soil horizons and classes: they established multiple anthropic soil diagnostic horizons to identify various complicated soil classes due to the long cultivation history in China; they set up the "ferric horizon with low-activity clay" to identify ferrosals extensively distributed in subtropical monsoon areas; they proposed "aridic epipedon" to identify arid soil in northwestern China; they proposed "mattic epiepdon" to identify soils of Qinghai-Tibet Plateau. All these above researches not only solved soil classification problems in China, but also served as a reference to the rest of the world.

Their pioneer work systematically established an anthropic soil diagnostic system, which combed original chaos of soil classification of diversified anthropogenic soils in China. Their diagnostic criteria were accepted by WRB (World Reference Base for Soil Resources), and became its standards for international soil classification. Dr. H. Eswaran, President of the Soil Classification Committee, IUSS, pointed out that anthropic soil classification was an innovation in Chinese Soil Taxonomy.

In this research, they published 18 monographs and more than 600 papers. The soil classification has been recommended as criteria by Soil Science Society of China (SSSC). Internationally, it is also widely accepted and was collected in *Encyclopedia of Soil Science*.

Soil classification system in China has extensive application perspectives. Sustainable agricultural development and ecosystem construction in China need a quantitative soil

inventory, which must be based on a modernized soil classification system. Thus, Chinese Soil Taxonomy will benefit future soil survey and soil mapping, soil evaluation, soil resource utilization, and ecosystem construction as well as environmental protection.

Inspiration Was Just Floating in the Natural Air—Research in Key Laboratory of Organic Solids, Institute of Chemistry of CAS (Editor: Translated from Science Times in China)

Sponsored by NSFC, CAS, and Ministry of Science and Technology, the Key Lab of Organic Solids in Institute of Chemistry of CAS developed tungsten oxide "light switch" membrane, which has wetting and discolorment abilities. Thereafter, the team progressed in the research of preparation for stable metal hydrophobic surface, and successfully developed metal hydrophobic membrane. As they say, "Since the establishment of our lab in 1999, our achievements come from inspirations floating in the natural air".

This type of light switch is a nano scale tungsten oxide membrane developed in an electro-chemical deposition process. The so-called "light switch" is a material that exhibits "hydrophilic" and "hydrophobic" properties before and after irradiation. When we want hydrophilic property on a special position of the material, we use ultraviolet light irradiating on that point, and then, water beads spread on the surface of the material to realize light switching function. In the experiment, researchers exposed the membrane in ultraviolet light and in black alternatively, effecttively realized the combination of light-induced discolorment and light-induced wetting/dewetting.

Another research achievement in this lab is that they developed a steeping method, which utilized electrochemical deposition and self-assembly technologies, effecttively controlled surface wettability of copper, and utilized biomineralization technology to construct surface appearance. This method constructed a stiffening hydrophobic membrane with a surface with a touching angle of 162 degrees and a rolling angle of 5 degrees. And the membrane had excellent environmental stability (it can be exposed in air for several months without property change even in touch with organic agents).

Because of extensive applications of biomimic hydrophobic membranes, it caught concerned eyeballs in recent years. Researchers have utilized low surface energy silicofluoroform and hydrophilic polymers to prepare a series of hydrophobic surfaces, however, the problem of metal surface hydrophobicity was still hung out in the air. Their steeping method has features of simplicity, cheapness, and mass producible. It is helpful for metal cleaning and antisepsis.

In 2002, through their research in micro/nano structure of lotus leaf, they disclosed the hydrophobic self-cleaning mechanism of lotus leaf. In the same time, they discovered that the oriented arrangement of micro/ nano structure on rice leaf surface is a main reason to explain anisotropic rolling of water beads on leaf surface. This discovery directly pointed out that orientation of surface micro/nano structure determines the water motion trend. The related paper was published on *Adv. Mater.*

Thereafter, the research team did their research in microstructure of strider leg, and explained that a combined effect that strider can move stably on water surface comes from the micro/nano structure and organic grease. This discovery is very helpful for dynamic hydrophilic surface design, hence refreshes design of new water transportation vehicles. It was also reported by quite a few medias as *Science*, *C&EN* and *National Geographic News* etc. In 2005, in their research of biomimic foot of gecko, they developed polystyrene nano array membrane by utilizing alumina template. This work was published by *Adv. Mater.*, and reported in *News & Views* by *Nature*. Currently, they are still seeking their work in biomimic nano materials.

In recent years, they published roughly 100 SCI papers, including 1 in *Nature*, 12 in *Angew. Chem.*, 6 in *JACS*, and 13 in *Adv. Mater.*. Their achievements honored the 1st class Science & Technology Award of Beijing in 2004, and the 2nd class National Science and Technology Award in 2005. They have 31 authenticated patents in applied basic research.

Amorphous Alloy and Magnetic Stabilization Bed

Sponsored by NSFC, a research team led by Prof. Enze Min (CAS Member) from Research Institute of Petroleum Processing, through 20 years' effort, settled the puzzled grave issue that amorphous alloy material has small specific surface area and low thermal stability. At the same time, they developed magnetic stabilization bed. Their innovation in catalyst and reaction process and in their project – "catalytic chemistry and