Electro-mechanical Coupling of Ferroelectric Ceramics" on *Comprehensive Structural Integrity of Elsevier*. Prof. Fang designed a new failure parameter - COD of electric induced failure, and set new criterions to justify this parameter. They performed crack experiment for central crack sample under electromechanical coupling load. Their experiments showed that the new criterions could well describe the influence of electronic field on crack load.

Under support of NSFC, the cooperative work of Prof. Zheng and Prof. Huang honored the 2nd class National Science & Technology Award in 2004. The cooperative work of Prof. Yang, Prof. Fang and Prof. Huang honored the 2nd class National Science & Technology Award in 2005.

Transfer Methane to Fragrant Hydrocarbon by Direct Catalyzed Dehydrogenation

Sponsored by NSFC, a research project - "Transfer methane to fragrant hydrocarbon by direct catalyzed dehydrogenation", directed by Prof. Yide Xu, and Prof. Xin Bao from Dalian Institute of Chemical Physics of CAS, honored the 2nd class National Science & Technology Award in 2005.

To transfer catalyzed methane into liquid fuel or chemical material is one of hot spots in today's chemical research. Because of high stability and high symmetry of methane molecule, to activate and transfer this molecule escalates challenges in catalysis science. And how to effectively activate methane molecule and realize carbon-carbon bone coordinated growth is one of key issues.

On the basis of previous research, in 1993, the research team reported their results that, under a condition of continuous flow without oxygen, methane was directly transferred to fragrant hydrocarbon and hydrogen with catalyst Mo/HZSM-5. In the past decade, their research progressed in the following:

1) Their research showed that, till now, Mo/HZSM-5 is still the best catalyst in their experiment.

2) They proposed that the valent state and binding site of Mo species, and acidity as well as pore structure of HZSM-5 molecular sieve are major factors to catalyze methane in a non-oxygen condition. They further disclosed function and mechanism of catalyst Mo/HZSM-5 in the experiment.

3) They studied variations in the binding site and distribution of Mo species during preparation of Mo/ HZSM-5 molecular sieve, and showed that in roasting process, several Mo species migrated in the pore channels of HZSM-5 sieve, and interacted with B-acid center and Al frame of the molecular sieve in their self-designed NMR system (this system holds a Chinese patent). They obtained dynamic variation information of B-acid center of HZSM-5 molecular sieve in near-real reaction conditions, and discussed relationship between the activity of catalyst Mo/HZSM-5 and the whole chemical process.

4) They developed a new type catalyst: Mo/MCM-22, which obviously reduced the selectivity of naphthalene and increased that of benzene in the chemical product. And the anticaking capability of Mo/MCM-22 is better than Mo/ HZSM-5.

5) Based on the research results of interactions between Mo species and B-acid center, stability of catalyst Mo/HZSM-5 was improved, and in the same time, caking products were reduced. It was further disclosed in their research that, in their experiment, methane activation and its transformation to middle product were control processes, further reaction of middle product only needed a few B-acid centers, the leftovers could negatively influence the reaction to produce caking. They also studied inducing period and caking mechanism in their experiments, and proposed 3 types of caking, namely, molybdenum carbide species, caking on molybdenum carbide, and caking of B-acid centers.

6) They proposed and proved coupling process of methane oxidative coupling and methane non-oxygen dehydrogenation. This prolonged catalyst lifetime in their experiment by 3 times.

In the 10-year effort, they published 68 papers on international journals. Till Feb. 2005, their publications were sited by others 815 times, and their first publication in 1993 was sited 157 times. They applied 23 patents, among which 8 were authenticated. They were invited to write summary articles on their work on international catalysis journals and present their work on several international conferences.

DNA Logic Switch for Future DNA Computing

Under funding supports from NSFC, CAS, Ministry of Science and Technology, and Science and Technology Committee of Shanghai, Prof. Chunhai Fan from Shanghai Institute of Applied Physics of CAS cooperated with Prof. Lin He (CAS Member) from Bio-X center of Shanghai Jiao Tong

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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

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