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NEWSLETTER

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IN THIS ISSUE

SPECIAL ISSUE

Earmark Projects for Proprietary Innovative Findings

Nine Chinese government agencies, including State Development and Reform Commission, Ministry of Science and Technology, Ministry of Finance, and Ministry of Education, have recently issued a policy document to facilitate the commercial applications of proprietary innovative findings. According to the document, China will create a range of earmark projects for major proprietary innovative findings in the area of information, biology, aeronautics and space, advanced materials, advanced energy, modern farming, advanced manufacturing, energy efficiency and emission reduction, and marine development. The earmark projects will be favored with needed policies and funds. Under the guidance of establishing a technology innovation system with industry being a major

player, operated in line with the market mechanism, through a combined force of industry, universities, and research institutes, an array of national engineering or technology research centers, national engineering labs, and national key labs will be created to support the earmark projects identified by the government. Meanwhile, industry associations will be allowed to play the role of consultation, information provider, and match maker in the process.

To implement the taxation holiday policies for commercial applications of proprietary innovative findings, the government will encourage industry to enhance its input in the area. The increased investment in new technologies, products, and techniques will be made as part of the items to be deducted when calculating the payable taxes. Enterprises may also enjoy import tax cuts, if the proprietary innovative findings fall into the category defined by the *Guidance for High Tech Development Priorities*, or by the *Guidance for Industrial Restructuring*.

RESEARCH AND DEVELOPMENT

New Theory for Innate Immunity

TANG Hong and FU Yangxin, research fellows working at the Center for Infection and Immunity, Institute of Biophysics under Chinese Academy of Sciences, have recently published in the journal of *Trends in Immunology* a paper titled *Do adaptive immune cells suppress or activate innate immunity*, to illustrate their new theory that innate immune reaction works with T cells.

Study results show that the watershed for the innate immunity and adaptive immunity may not be as clear as one has thought of. As a matter of fact, T cells have been part of the innate immune reaction, and played a role of maintaining such reaction. Previous theories believed that the low level of both innate and adaptive immune reactions makes a major cause for the death of prematures 'acute infection. Lab experiments found that adaptive immune cells actively dampen initial innate responses, effectively confining the innate immune reaction to an allowed level. Newborn rats or premature babies are unable to control their innate immune reactions to infections, as the result of poor adaptive immunity. In this context, the infection storm constitutes the cause of their death. It is found that on the one hand, adaptive immunity is able to inhibit the reactions to infections at an early stage, and is also able to remove the specificity of pathogens on the other. Both functions cannot work without the other.

The new theory makes a fine guidance for understanding the reactions to viral infections and associated virus removing mechanisms, and for preventing the patients with reduced immunity (newborns, elders, and patients receiving chemotherapy, organs transplanting,

and AIDS patients) from getting infected.

Avian Influenza Polymerase PAN Reveals an Endonuclease Active Site

On the basis of their findings on avian influenza RNA published in the August 2008 issue of journal *Nature*, a research team, led by LIU Yingfang at Institute of Biophysics, Chinese Academy of Sciences, and a study team, headed by RAO Zihe at a joint lab established by both Nankai University and Tsinghua University, have further analyzed the high resolution crystal structures of an avian influenza polymerase PAN, and revealed an endonuclease active site. The finding has overruled the previous findings that only PB1 had such a function. The journal *Nature* published the finding on February 4, 2009.

LIU, RAO and coworkers had a systematic study of the basic structures of the PA of H5N1 RNA. They believe that the heterotrimeric influenza virus polymerase, containing the PA, PB1 and PB2 proteins, catalyses viral RNA replication and transcription in the nucleus of infected cells. PB1 holds the polymerase active site 1 and reportedly harbours endonuclease activity, whereas PB2 is responsible for cap binding. The PA amino terminus is understood to be a major functional part of the PA protein, and has been implicated in several roles, including endonuclease and protease activities as well as viral RNA/complementary RNA promoter binding. Structural comparisons and mutagenesis analysis of the motif identified in PA N provide further evidence that PA N holds an endonuclease active site. Furthermore, functional analysis with in vivo ribonucleoprotein reconstitution and direct in vitro endonuclease assays strongly suggest that PA N holds the endonuclease active site and has critical roles in endonuclease activity of the influenza virus polymerase, rather than PB1. The high conservation of this endonuclease active site among influenza strains indicates that PA N is an important target for the design of new anti-influenza therapeutics.

The study has been financed by Chinese National Natural Science Foundation, Chinese Ministry of Science and Technology, and Chinese Academy of Sciences.

Fully Biodegradable Polyester Materials

It takes some 3-year for CAS Changchun Institute of Applied Chemistry to land an important breakthrough in developing a fully biodegradable polyester material with an enhanced radiation performance. Researchers successfully turned the polyester material from a radiation cleavage oriented polymer into a crosslinked polymer, using multifunctional vinyl monomers. On the said basis, they raised the heat resistance temperature of the materials using plant fibers, and enhanced the effects produced by the said two approaches in raising the heat resistance of the materials, through screening the right fibers, forms, and synthesizing methods, and optimizing the formula and techniques of radiation crosslink. So far they have produced a range of compound materials enjoying

a raised heat resistance temperature from 60℃ to 100℃, including polyester/wooden fiber, polyester/flour fiber, polyester/sugarcane dregs, and polyester/glass fiber, meeting the market needs for generic plastic products and widening the applications.

Meanwhile, they studied the radiation effects of the materials, and found the right solutions to addressing the issues of total disinfection dosages, based on the merits of radiation disinfection technology, including environment friendly, safe, and thorough, which effectively avoided the possible secondary pollution that may bring up by medical polyester plastics, and laid an important foundation for the commercial applications of such products.

Maximum Strength in Nanotwinned Copper

A research team, led by LU Lei, Shenyang National Laboratory for Materials Science, Institute of Metal Research under Chinese Academy of Sciences, in collaboration with LU Ke, and Dr. HUANG Xiaoxu at Technical University of Denmark, has obtained super fine metals with a nanostructure, by taking advantage of the unique stable interface of nanotwinned materials, and found that the strength increases with decreasing twin thickness. The finding shows that when the characteristic size of a pure metal is reduced to the nanometer level, the change would result in the largest strength, and a super hardening effect that generic metals are not up to. The findings was published in January 30 issues of magazine *Science*.

LU Lei and coworkers have successfully reduced the averaged twin thickness to 4 nanometers in a copper sample, using pulse sediment techniques, and found that the strength increases with decreasing twin thickness, reaching a maximum at 15 nanometers, followed by a softening at smaller values that is accompanied by enhanced strain hardening and tensile ductility. At a level of 10 nanometers, the hardening coefficient exceeds the one allowed for processing the coarse copper, or the upper limit for such processing. It was also found that the strongest twin thickness originates from a transition in the yielding mechanism from the slip transfer across twin boundaries to the activity of preexisting easy dislocation sources, and that the hardening effects come from the dislocation of twin density, with a raised saturated or dislocated density by one to two magnitude, compared with regular polycrystalline materials.

Novel MRI Contrast Agent

Thanks to their nearly 3-year efforts, researchers of CAS Chagnchun Institute of Applied Chemistry have developed 12 novel MRI contrast agents in five categories using proprietary techniques. Not long ago, the new products have passed experts 'verification check.

Researchers have synthesized 12 novel MRI contrast agents based on

arabinogalactan-proteins, Russian olive amylose, glucosan, glycyrrhizic acid, and manganese polyoxometalates, by taking advantage of the natural carriers derived from China's rich forest and plant resources. The series contrast agents have gone through a range of pre-clinical tests, including synthesizing techniques, physical properties, dosages, test techniques, quality indicators, and stability, in addition to the toxic effects on target organs. The results of comprehensive evaluation show that the novel contrast agents have a relaxation, stability, and acute toxicity that are better than Gadopentetate Dimeglumine, a contrast agent that has so far enjoyed the widest clinical application. The arabinogalactan-proteins and Russian olive amylose based contrast agents are able to produce a laudable enhanced liver image.

In addition to its application in MRI imaging, the new products can also be used in S-ray, CT, and Y-ray imaging, with a fine application perspective. The Institute has filed 4 domestic invention patent applications, and has been granted with one.

New Biodegradable Plastics

SPC, in collaboration with SINOPEC Beijing Research Institute of Chemical Industry, has recently rolled out a novel biodegradable plastic product using a unique technique and catalyst developed by SINOPEC. The test results issued by the National Quality Test Center for Plastic Products show that the new product has reached a decomposition rate of 62.1% in 94 days, up to the national standards defined for biodegradable plastics. The new product enjoys a decomposition performance similar to the one produced by a renowned foreign company.

The new product is of a greatly raised heat resistance, compared with the similar products produced by SPC, with the temperature allowing for deformation exceeding100℃, desirable for instant plates or cups for catering, bags for holding instant medical equipment, thin film for packaging, garbage bags, food box, packages for electronics, thin films for farming applications, pesticides bags, and slow release materials for chemical fertilizer. The new biodegradable plastic materials, when mixed with starch at a desired proportion, can be made into other products. The products, made of the materials, become the food 'for the microorganisms in the soil when buried. Microorganisms eat the plastics, and decompose them in a harmless manner.

NEWS BRIEFS

Key Components for Nuclear Fusion Device

Chinese scientists have recently made a major progress in nuclear fusion studies, and

independently rolled out the key components for the nuclear fusion device. For example, the shield blanket is a key component of the nuclear fusion device. It is made of the highly purified beryllium. Chinese scientists have mastered the techniques to extract such beryllium. One has to save the nuclear fusion device with a weight of more than 20,000 tons from possible troubles when it is geared to a shaking state. Chinese scientists have developed the needed component to support the heavy device. The breakthroughs of these key components have been acknowledged by ITER Nuclear Fusion Energy Organization. China will share these products with their international counterparts.

Shanghai Hosts largest Astronomic Telescope in Asia

A project to build a 65-m radio telescope was kicked off by CAS Shanghai Observatory. Located in Sheshan, Shanghai, the telescope will be completed of its construction at the end of 2012, and become the largest and internationally advanced motor radio telescope with a full array of antenna in the Asia. The new telescope will be used to work on orbit measuring and positioning for VLBI in Phases II and III of China's moon probe project and other deep space probes. The operation of the new telescope will raise the sensitivity of China's large radio telescope and its capability at cm and long mm wave levels. The new telescope will be the third of its kind in the world, in terms of caliber, only next to the United States (110m), and Germany (100m).

According to a briefing, China, Japan, and the Republic of Korea are working together to build a more powerful VLBI network to probe the structures of the Milky Way and black holes with super masses. The 65-m new telescope will play a major role in the operation of the new VLBI network.

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