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Explore New Directions and New Paths for Nanotechnology

Cooperation between China and Brazil

Editor's Note: At the 1st Brazil-China Nanotechnology Seminar of the Pujiang Innovation Forum 2023, experts and scholars from China and Brazil conducted in-depth discussions on nanotechnology innovation and industrial development, focusing on exchanges and cooperation in key areas. This bulletin summarizes views of guests at the 1st Brazil-China Nanotechnology Seminar for your reference.

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Over the past 50 years since the establishment of diplomatic ties between China and Brazil, they have forged strategic or comprehensive strategic partnerships, and their relations have maintained a momentum of steady progress. Since China and Brazil signed a science and technology cooperation agreement in 1982, they have achieved fruitful results. The two sides have carried out extensive and fruitful cooperation in platform construction, joint research, science and technology parks, and exchanges of scientific and technological personnel, etc. The field of nanotechnology is the core of scientific and technological cooperation between the two countries. The guests attending the Seminar agreed that China and Brazil have a solid foundation and broad prospects for nanotechnology innovation cooperation. Both countries attach great importance to nanotechnology and industrial development. They have achieved results in nanotechnology research and development and in the application of research results to production. In the future, they should continue to explore new directions and new paths for comprehensive cooperation between the two countries.

First, Brazil-China cooperation in nanotechnology innovation has a solid foundation and broad prospects. Xu Jie, Deputy Director General of the Department of International Cooperation of the Ministry of Science and Technology of the People's Republic of China, pointed out that under the framework of intergovernmental scientific and

technological cooperation mechanisms such as the Scientific and Technological Innovation Sub-committee of the Sino-Brazilian High-level Coordination Commission and the China-Brazil High-level Dialogue on Science, Technology and Innovation, the two sides have carried out extensive and fruitful cooperation in the establishment of cooperation platforms, joint research, policy coordination in science and technology parks, and exchanges of scientific and technological personnel, etc. The methods and contents of scientific and technological cooperation between China and Brazil continue to expand, and new highlights of cooperation continue to emerge, delivered tangible benefits to the peoples of both sides and further strengthening confidence of China and Brazil to jointly meet common challenges. Nanotechnology is one of the key areas of scientific and technological cooperation between China and Brazil. The two sides have supported scientific research institutions and universities to establish joint laboratories in the field of nanotechnology, and they have carried out practical exchanges and cooperation. **José Roberto de Andrade Filho, Deputy Consul General of the Consulate General of Brazil in Shanghai**, pointed out that China and Brazil have a ten-year history of cooperation in the nano field and laboratories. **Wang Jingfeng, National Engineering Research Center for Nanotechnology**, pointed out that in 2011, China and Brazil established the China-Brazil Nanotechnology Joint Research Center to promote the application of nano achievements to production and build a bridge between industry and scientific research through cooperative absorption.

Second, both China and Brazil attach great importance to

nanotechnology research and industrial development. **Cui Daxiang**, National Engineering Research Center for Nanotechnology, pointed out that China has initiated the National High-tech R&D Program of China (863 Program), the National Key Basic Research Program (973 Program), and the National Key R&D Program; and that China has set up the National Center for Nanoscience and Technology in Beijing, mainly conducting basic scientific research on nano; and set up the National Engineering Research Center for Nanotechnology in Shanghai, mainly conducting applied nano-based research and industrialization of technology. Since 2010, researchers in China have published more than 15,000 papers on nanotechnology every year. China has become a country with the highest number of published papers in the world. It has applied for more than 2,000 invention patents every year, and trained more than 5,000 graduates in the field of nanotechnology every year.

Rodrigo Capaz, Representative of the Brazilian Center for Research in Energy and Materials, pointed out that the Brazilian Nanotechnology National Laboratory is the largest nano-strategic laboratory, including the nanomaterials department, the nanobiotechnology department, and the nanoequipment department, with high-end, precision and sophisticated research infrastructure in Brazil. **Felipe Silva Bellucci, General Coordinator of Enabling Technologies at the Brazilian Ministry of Science, Technology and Innovation**, pointed out that 17 of the national institute of science and technology are dedicated to the fields of nanotechnology and advanced materials. The Brazilian nanotechnology laboratory system consists of 23 highly advanced nanoscience and nanotechnology laboratories, covering such fields as medicine,

agriculture, and telecommunications. Brazil attaches great importance to research and industrial innovation. It has established the Brazilian Association for Research and Industrial Innovation under the Ministry of Science, Technology, and Innovation (MCTI) to help Brazilian industries innovate by increasing cooperation between industry and universities. Among others, 77 institutions are engaged in research on advanced materials with nanotechnology.

Third, exchanges and cooperation between China and Brazil in nanotechnology research and development and in the application of research results to production are beginning to take shape. Cui Daxiang noted out that since the National Engineering Research Center for Nanotechnology was awarded an international cooperation base by the Department of International Cooperation of the Ministry of Science and Technology of the People's Republic of China in December 2007, it has been conducting international exchanges and cooperation on nanotechnology research and development and on the application of research results to production, and it has carried out academic exchanges and in-depth cooperation with universities, institutions, and enterprises in Brazil, Japan, Russia, the United Kingdom, Cuba, the United States, Germany, Australia and other countries. **Wang Jingfeng** pointed out that since China and Brazil signed a number of cooperation agreements in 2012, they have jointly published more than 50 papers and achieved a number of results, such as the project of "Preparation of Activated Carbon Materials from Sugar Bagasse". The prepared materials are environmentally friendly and inexpensive, and have demonstrated good water treatment results. **Arnaldo Gomes Leal Júnior**, Professor of the

Universidade Federal do Espírito Santo, pointed out that the Universidade Federal do Espírito Santo cooperates with Chinese universities in textile fabrics, which are mainly used in the field of smart health care and clothing accessories. Meanwhile, Chinese and Brazilian scientists are actively cooperating on the projects under the BRICS Science and Technology Initiative Framework. For example, Arnaldo Gomes Leal Júnior participated in the BRICS Science and Technology Initiative framework cooperation project involving China and India. **Ivair Aparecido dos Santos, Professor of the State University of Maringá**, participated in the BRICS Science and Technology Initiative framework cooperation project involving Russia and China, conducting research on magneto-electric spin-orbit (MESO) logic devices for ultra-low power consumption computation.

Fourth, the future model and path for innovation cooperation between China and Brazil in the nano field. Cui Daxiang pointed out that the directions of our cooperation include nano-environmental energy, nano-information, sensing, nano-biomedicine, and engineering. The integration of medicine and engineering is a good path for the innovation and development of precision medicine. Medicine-engineering interdisciplinary cooperation is the in-depth integration of molecular biology, genomics, artificial intelligence technology, big data, cloud computing, Internet of Things, quantum computing, 5G/6G, and AR/VR, etc., which is mainly used for disease diagnosis, prevention, and treatment. Dr. **Gary Li, Chief Scientist of Suzano**, pointed out that Suzano has built an entity innovation center in China, to develop bio-based nanomaterials and promote the development of a low-carbon

economy. In the future, it can unite with universities, research institutions, and enterprises related to bio-based materials, to promote open, collaborative, and sustainable development.

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