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RIS Science Diplomacy News Alert is your fortnightly update on Indian and global developments in scientific research, technological advancements, and G-20, global challenges, science diplomacy, policy and governance. The archives of this news alert are available at https://fisd.in/en/alerts-archives. Please email your valuable feedback and comments to science.diplomacy@ris.org.in.

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SCIENCE & TECHNOLOGY

GLOBAL

Breakthrough Recyclability of Carbon Nanotube Sheets Demonstrated

Researchers at the Madrid Institute for Advanced Studies (IMDEA) Materials Institute have demonstrated the recyclability of high-performance carbon nanotube (CNT) sheets while maintaining their essential mechanical and electrical properties. It represents a significant advance in sustainable nanostructured materials and holds promise for carbon nanotube fibers, sheets, and textiles to play a pivotal role in the future transition to green energy. It demonstrates that high-performance materials made from carbon nanotubes can be reused as structural reinforcement or electrical conductors. The work utilizes carbon nanotubes rapidly grown and directly assembled into freestanding network materials by means of floating catalyst chemical vapor deposition (FCCVD) synthesis process.

Nitrogen-based Compound Used as New High-performance Energy Storage Material

Researchers at the University of Bayreuth have synthesized scandium polynitrides under extreme conditions, with exotic chemistry and potential applications as high-energy-density materials.Nitrogen-bearing compounds are among the most effective choices for High-energy density materials (HEDMs). Nitrogen-rich materials are capable of releasing a huge amount of energy during decomposition or combustion (when single bonds are replaced by triple ones), making them highly effective as propellants and explosives. The decomposition of nitrogen-bearing compounds often results in the formation of nitrogen gas (N2), which is a stable, inert, and environmentally friendly product.

Carbon Dioxide Converted to Methanol through a Recycled Reagent

Scientists in the U.S. Department of Energy's (DOE) Brookhaven National Laboratory and the University of North Carolina Chapel Hill (UNC) have demonstrated the selective conversion of carbon dioxide (CO2) into methanol using a cascade reaction strategy. The two-part process is powered by sunlight, occurs at room temperature and at ambient pressure, and employs a recyclable organic reagent that's similar to a catalyst found in natural photosynthesis. It is an important step in the use of renewable organic hydride catalysts to the decades-long quest for room temperature catalytic methanol production from CO2.

AI Model to Generate New Antibiotics Developed

Researchers at Stanford Medicine and McMaster University have developed an artificial intelligence model, SyntheMol, capable of designing new potential drugs. The AI was used to create structures and synthesis methods for six new drugs capable of battling resistant strains of Acinetobacter baumannii, a major cause of antibacterial resistance-related fatalities. Prior to generative AI such as SyntheMol, researchers used computational methods to seek potential antibiotics, using algorithms to search through existing drug compounds to identify possibilities. The advantage of generative AI is its ability to "hallucinate", formulating entirely new responses. However, previous tests of this method resulted in impossible-to-synthesize molecules. To combat this, the researchers put restrictions on SyntheMol to ensure that the generated compounds could be created in a lab. SyntheMol was trained on a library of more than 130,000 molecular building blocks and a range of chemical reactions, equipping the model with both the end results and the steps needed to reach them. SyntheMol produced around 25,000 potential antibiotics in under nine

hours. Researchers narrowed these suggestions down to the 70 compounds with the highest levels of potential efficacy.

INDIA

Drone System for Disaster Search Developed

Engineers at MIT World Peace University (WPU) have developed an artificial intelligence (AI)- and machine learning (ML)- based 'automatic alarm generation, aid and surveillance system' by deploying a multi-copter that will act as first responder during disasters. The drone system is expected to be beneficial to governing bodies during emergencies. The Multi-copter can be employed to detect and aid people stuck in inaccessible areas. It can also report back the impact of the event and help assess the situation. The system enables efficient search and rescue missions, 3D mapping, and precise payload drop-offs**.**

Paper-based Platform to Detect Antibiotic Resistant Bacteria

The Indian Institute of Science (IISc) Bangalore and Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) have developed a paper-based platform that could help detect the presence of antibiotic-resistant bacteria. The approach developed by the team involved incorporating biphenyl-4-carboxylic acid (BCA) within a supramolecular hydrogel matrix containing terbium cholate (TbCh). This hydrogel normally emits green fluorescence when UV light is shined on it. The luminescence signals the presence of antibiotic-resistant bacteria, and the intensity of the luminescence indicates the bacterial load. For non-resistant bacteria, the green intensity was found to be extremely low, making it easier to distinguish them from resistant bacteria.

Quantum Dot Technology to Clean Water

Team of researchers at the Aligarh Muslim University is working on the use of carbon- and sulfur-based quantum dots, to create safer invisible inks and to help decontaminate water supplies by removing pollutants. In addition to identifying contaminants, Cdots can help break down pollutants such as pesticides and dyes in water. The team has also developed methods to remove contaminants from water entirely, rather than just identifying or degrading them. They've specially designed Cdots to sop up automotive oil and are currently exploring a Cdot-based filter system to help treat oil spills. Their work can help broaden the uses for nonmetallic quantum dots and put their unique properties to work in the environment.

GLOBAL CHALLENGES

AI to Detect COVID in Lung Images

Researchers at Johns Hopkins University have demonstrated that artificial intelligence can spot COVID-19 in lung ultrasound images. They developed this automated detection tool to help doctors in emergency settings with high caseloads of patients who need to be diagnosed quickly and accurately. They aim to develop wireless devices that patients can use at home to monitor progression of COVID. The AI analyzes ultrasound lung images to spot features known as B-lines, which appear as bright, vertical abnormalities and indicate inflammation in patients with pulmonary complications. It combines computer-generated images with real ultrasounds of patients. The team developed software that can learn from a mix of real and simulated data and then discern abnormalities in ultrasound scans that indicate a person has contracted COVID-19.

The tool is a deep neural network, a type of AI designed to behave like the interconnected neurons that enable the brain to recognize patterns, understand speech, and achieve other complex tasks.

Joint R&D in Energy for SDGs

The National Power Training Institute and PTC India Ltd. have entered into a Memorandum of Understanding to establish a Centre of Excellence (CoE) for Research & Development in the Energy Domain, with a focus on promoting sustainable development goals. The outcomes of the CoE's Research and Development endeavours will be disseminated to the power sector through Training and Capacity building. Under the MoU, NPTI and PTC India Limited will collaborate to undertake research, development, and knowledge sharing through the CoE. The MoU was signed in the office of Ministry of Power, New Delhi, on 28th March, 2024 by Director General, NPTI, Dr. Tripta Thakur and by Senior Vice President (HR), PTC India Ltd., Ms. Koel Singhal on behalf of CMD, PTC India Ltd., Dr. Rajib K Mishra; in the presence of Secretary, Ministry of Power, Government of India, Shri Pankaj Agarwal.

RESOURCES & EVENTS

G20 Employment Working Group Meeting Held in Brasilia

The G20 Employment Working Group (EWG) meeting held under the Brazilian presidency in the city of Brasilia began with a special session dedicated to the follow-up of implementation of commitments made during India's G20 presidency to develop an international reference classification of occupations and skills. In the meeting, the Indian delegation highlighted the need for G20 countries to work towards the G20 EWG commitment of the Indian Presidency in 2023 for the incorporation of basic and extended indicators in respective national surveys for mapping global skills gaps. This classification of occupations and skills has the potential to benefit developed, developing and least developed nations alike. The leaders also deliberated upon the critical issues of the impact of care policies and equal pay in promotion of gender equality in the world of work and acknowledged the challenges faced by women due to disproportionate caregiving responsibilities and the necessity of supportive care policies. Another key agenda taken up was the issue of pay disparity between genders.The meeting concluded with comprehensive discussions on equality in the world of work. It was emphasized that equality is an economic necessity not just a moral obligation. The meeting concluded with a strong reiteration of the collective resolve of the G20 countries to continue working towards advancing gender equality, diversity at workplace and social security.

Inter-Ministerial Joint Workshop on Blue Economy

The Ministry of Earth Sciences (MoES) organised a consultative workshop in New Delhi today on the Blue Economy Pathways study report status. Experts from the World Bank, various line Ministries like the Ministry of Statistics and Programme Implementation, Ministry of Environment, Forest & Climate Change, Ministry of Fisheries, Animal Husbandry and Dairying, Niti Aayog, Ministry of Port Shipping and Waterways, Ministry of Tourism and various state and national R&D organisations participated. During the workshop, the collaborative role of each line Ministry towards the preparation of the report was deliberated upon.MoES has engaged with the World Bank as a knowledge partner to undertake a technical study and prepare a seminal report titled 'India's Blue Economy: Pathways for resource-efficient, inclusive and resilient growth in India'**.** The report outputs are expected to cover the areas related to global best practices in Blue Economy

implementation, ocean accounting framework, institutional strengthening and innovative finance mechanisms towards implementing the Blue Economy Policy framework.

SCIENCE POLICY AND DIPLOMACY

Canada Signs BBNJ Agreement

On 4 March 2024, the United Nations Legal Counsel received Canada's Minister of Fisheries, Oceans and the Canadian Coast Guard, The Honorable Diane Lebouthillier, to officiate the signature by Canada of the Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (BBNJ Agreement). This is the 88th signature of the BBNJ Agreement since it opened for signature on 20 September 2023, and two countries ratified it already. The Legal Counsel congratulated Canada on behalf of the Secretary-General and expressed his utmost confidence that the BBNJ Agreement holds the potential to make significant contributions to addressing the triple planetary crisis of climate change, biodiversity loss, and pollution, as well as achieving ocean-related objectives and targets of the 2030 Agenda for Sustainable Development and the Kunming-Montreal Global Biodiversity Framework.

India and Indonesia to Cooperate in Space Sector

The Indian Space Research Organisation (ISRO) and Indonesia's National Research and Innovation Agency (BRIN) signed new agreements on Monday, March 19, strengthening their space exploration and technology partnership, the Indian Embassy in Jakarta said in a written statement. The agreement, attended by Dr. Laksana Tri Handoko, BRIN Chairman and India's Ambassador to Indonesia, Mr. Sandeep Chakravorty, underscores a deepening space collaboration between India and Indonesia. The ceremony in Jakarta marked the signing of the Implementation Agreement on Transfer of Title of Integrated Biak Telemetry, Tracking and Command (TTC) Facilities and Implementing Arrangement on Operation, Maintenance and Utilisation of Integrated Biak Telemetry, Tracking and Command (TTC) Facilities for Satellites and Launch Vehicles.

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