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IIT-I develops organic polymer that can tackle radioactive waste

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IIT Indore, IIT Roorkee and Indian Institute of Science Education and Research Thiruvananthapuram, have developed ionic porous organic polymer (iPOP-Bpy) through a novel one-pot synthesis method which is capable of absorbing hazardous chemicals and industrial wastes, said IIT officials on Monday.

The research has paved way for developing innovative solutions to address the challenges associated with the generation of radioactive wastes.

The research is led by Dr Suman Mukhopadhyay, Professor at IIT Indore and includes Sayantan Sarkar, Tanushree Ghosh, Argha Chakrobarty, Jagannath Majhi, Probal Nag, Anasuya Bandyopadhyay, Dr.Sivaranjana Reddy Vennapusa, and Dr Rajesh Kumar.

He said "The ionic porous organic polymer developed by the team is highly efficient in capturing iodine and its derivatives in vapour state as well as from water and organic solvents like hexane.This groundbreaking study represents the first successful synthesis of the iPOP-Bpy molecule, showcasing its multifunctional industrial implications. With proper calibration and engineering, this molecule can be readily transformed into practical, ready-to-use products."

Ammonia, extensively used in various industrial applications, poses significant risks to human health when present in moderate to high concentrations in the air. Inhalation of ammonia, even in low concentrations, can cause immediate burning sensations in the eyes, nose, and respiratory tract and may even lead to blindness. Therefore, an ammonia vapor sensor plays a crucial role in any comprehensive industrial waste management system, and the polymer developed by the team serves this purpose too. It can demonstrate rapid sensing capabilities for ammonia vapor, even at extremely low concentrations. This has been achieved by crafting a polymeric pad by affixing the polymer to a double tape. Upon exposure to ammonia vapor, the pad undergoes an instantaneous color change from pale yellow to deep blue.

Moreover, the material developed by the team holds tremendous potential for smart window applications. By undergoing reversible color changes upon the application of external inputs such as electrical potential, these smart windows offer benefits such as energy conservation, anti-glare functionality for rear-view mirrors, and low power consumption displays. The cost-efficient solution provided by this novel material is poised to revolutionize the manufacturing industry.

The study, published in the esteemed American Chemical Society (ACS) Advanced Materials & Interfaces, marks a new chapter in the pursuit of sustainable solutions for our planet's most pressing challenges.