Nanowire-Integrated MOFs for Pollutant Removal

Prelims: *Current events of National and International Importance| Environment*

Why in News?

*In a study reported in November 2026 by researchers at the Institute of Advanced Study in Science and Technology (IASST), Guwahati, copper nanowires inside isoreticular metal–organic framework-8 (IRMOF-8) paired with palladium or aluminum degraded up to **99%** of pyrene—a toxic polycyclic aromatic hydrocarbon—under light irradiation and ultrasonication.*

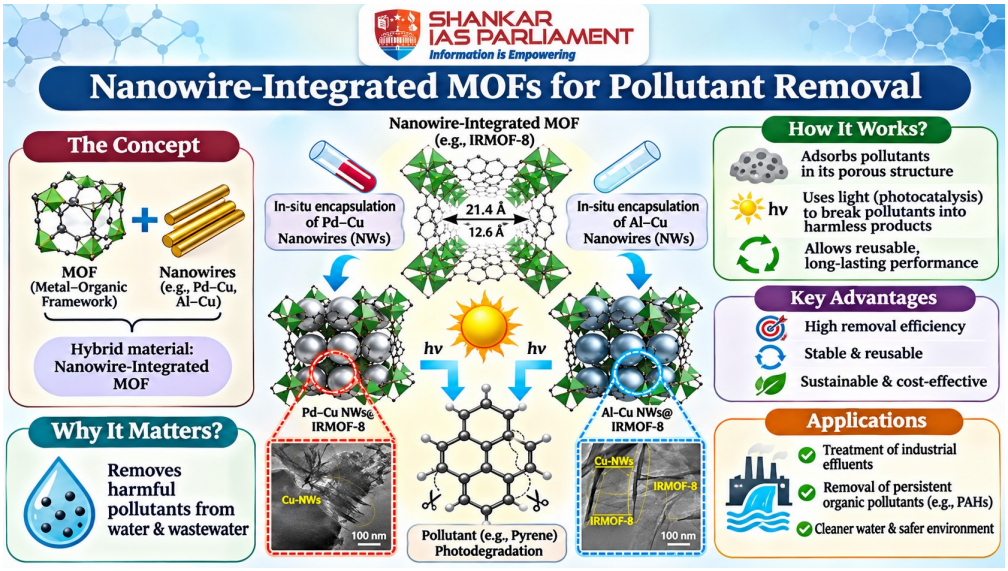
Nanowire-integrated metal–organic frameworks (MOFs) combine porous MOF structures with one-dimensional metallic nanowires to harvest light and break down persistent pollutants.

How It Works?

- **Porous MOF Host (IRMOF-8)–** Provides a confined space that brings components into close contact and supports efficient charge transfer.
- **Metallic Nanowires–** Capture a broad range of light wavelengths and enhance charge movement for photocatalytic breakdown.
- **Palladium vs. Aluminum–** Palladium boosts broadband light absorption through plasmonic interactions, while earth-abundant aluminum serves as a lower-cost antenna-reactor alternative.

Key Reported Results

- **Palladium-modified Cu NW in IRMOF-8– 99%** pyrene removal under tested irradiation and ultrasonication conditions.
- **Aluminum-modified Cu NW in IRMOF-8– 85%** pyrene removal under the same tested conditions.
- **Publication–** Led by Prof. Devasish Chowdhury and PhD scholar Netra Prova Baruah, published in *ACS Applied Energy Materials*.
- **Broader Context in Pollutant Removal –** Beyond light-driven PAH degradation, MOF hybrids and composites are researched for removing heavy metals, dyes, antibiotics, and emerging contaminants through adsorption, photocatalysis, and electrocatalytic membranes.



Reference

[PIB| Nanowire-Integrated MOFs for Pollutant Removal]

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