IASST's nanowire-MOF uses light to break down pollutant pyrene

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News

Scientists at the Institute of Advanced Study in Science and Technology (IASST), Guwahati, an autonomous institute of the Department of Science and Technology (DST), have built a metal–organic framework (MOF) integrated with copper nanowires and palladium nanostructures. In the laboratory it removed 99% of pyrene, a persistent toxic pollutant; a cheaper aluminium version removed 85% (reported 23 Nov 2026; study by Prof. Devasish Chowdhury and Netra Prova Baruah, journal ACS Applied Energy Materials). It works by photocatalysis: the metallic nanowires help the material absorb a broad range of light, including visible and near-infrared, and the excited electrons drive the breakdown of the pollutant. Using cheap, plentiful aluminium in place of costly palladium makes the approach more affordable.

Key facts for the exam

Point	Details
MOF	Porous "cage" with a huge surface area that traps pollutant molecules
Copper nanowires	Thin conducting wires that carry electrons quickly
Palladium nanostructures	Boost light absorption and catalytic activity
Target pollutant	Pyrene, a polycyclic aromatic hydrocarbon (PAH)

Point	Details
Result	99% (palladium), 85% (aluminium) – a laboratory result; field use is still to be tested

Background

- MOFs are crystals in which metal ions or clusters are joined by organic linker molecules, leaving regular pores; one gram can have a surface area of thousands of square metres. They are used for gas storage, carbon capture, water harvesting from air and pollutant removal.
- The 2025 Nobel Prize in Chemistry went to Susumu Kitagawa, Richard Robson and Omar M. Yaghi for developing MOFs.
- A nanometre is one-billionth of a metre; nanowires are only tens of nanometres thick.
- Pyrene is a polycyclic aromatic hydrocarbon (PAH) formed by incomplete burning of coal, oil, wood and vehicle fuel; many PAHs are carcinogenic. Titanium dioxide (TiO_2) is the classic photocatalyst; since it uses mainly ultraviolet light, catalysts that use visible light make better use of sunlight.

Tamil Nadu link: Tamil Nadu has a strong nanoscience base, for example the Centre for Nanoscience and Technology, Anna University, Chennai, and the nanotechnology research centre at SRM Institute, Kattankulathur.

Frequently asked questions

What is this news about?

Scientists at the Institute of Advanced Study in Science and Technology (IASST), Guwahati, an autonomous institute of the Department of Science and Technology (DST), have built a metal–organic framework (MOF) integrated with copper nanowires and palladium nanostructures.

What are the key facts to remember for the exam?

MOF: Porous "cage" with a huge surface area that traps pollutant molecules; Copper nanowires: Thin conducting wires that carry electrons quickly; Palladium nanostructures: Boost light absorption and catalytic activity; Target pollutant: Pyrene, a polycyclic aromatic hydrocarbon (PAH).

What is the background to this news?

MOFs are crystals in which metal ions or clusters are joined by organic linker molecules, leaving regular pores; one gram can have a surface area of thousands of square metres.

Practice questions (with answers)

1. What does 'MOF' stand for?

A) Molecular Optical Frame

B) Metal–Organic Framework

C) Multi-Oxide Film

D) Metal-Oxide Fibre

Answer: B – Explanation: Crystals in which metal ions are joined by organic linkers to leave regular pores; one gram can have thousands of square metres of surface.

2. Who won the 2025 Nobel Prize in Chemistry for developing MOFs?

A) Bawendi, Brus, Ekimov

B) Baker, Hassabis, Jumper

C) Clarke, Devoret, Martinis

D) Kitagawa, Robson, Yaghi

Answer: D – Explanation: Clarke's group won 2025 Physics; Baker's group 2024 Chemistry (proteins); Bawendi's group 2023 Chemistry (quantum dots).

3. IASST, which developed this nanowire-MOF, is located in which city?

A) Guwahati

B) Shillong

C) Kolkata

D) Bhubaneswar

Answer: A – Explanation: The Institute of Advanced Study in Science and Technology is an autonomous institute of the Department of Science and Technology (DST).

4. In lab tests, how much pyrene did the copper-nanowire–palladium MOF remove?

A) 75%

B) 60%

C) 99%

D) 85%

Answer: C – Explanation: The copper–palladium version removed 99%; the cheaper aluminium version 85%. The nanowires carry electrons quickly.

5. One nanometre equals:

A) 10^{-6} metre

B) 10^{-3} metre

C) 10^{-9} metre

D) 10^{-12} metre

Answer: C – Explanation: Nano = one-billionth; micro = 10^{-6}, pico = 10^{-12}, milli = 10^{-3}. Nanowires are only tens of nanometres thick.