Portable Sensor for Heavy Metal Detection in Water

Why in News

Recently, the **Centre for Nano and Soft Matter Sciences (CeNS)** has developed a **compact solid-state sensor** to **detect the heavy metal ions in water.**

It is a **portable** device which can help onsite detection in remote areas.

Key Points

- The compact solid-state sensor can detect the heavy metal ions like **lead ions (Pb2+) down to 0.4 parts per billion (ppb).**
- **Mechanism:**
  - A sensor film was prepared by **forming a composite** between **manganese doped zinc sulfide quantum dots** and **reduced graphene oxide on a glass substrate.**
  - These particular quantum dots are **water-soluble** and have **high photoluminescence (~30%) quantum yield,** making them suitable for **luminescence-based sensing.**

    Luminescence is emission of light by certain materials when they are relatively cool. It may be seen in neon and fluorescent lamps.
  - These quantum dots can be **excited with handheld UV (ultra-violet) light of 254 nm, thus making them portable** even to remote areas.

    Excitation, in physics, refers to the addition of a discrete amount of energy (called excitation energy) to a system—such as an atom, or a molecule—that results in its alteration, ordinarily from the condition of lowest energy (ground state) to one of higher energy (excited state).
  - If a **drop of water containing heavy metal ions** such as **mercury (Hg), lead (Pb), cadmium (Cd),** etc. are **added to the composite film,** the **emission of the film extinguishes within seconds.**

- The development of efficient and portable sensors for rapid onsite detection of heavy metal ions becomes important due to the **health hazards associated with them.**
    - Heavy metal ions pose severe potential threats to living beings (kidney damage, bone fractures, etc.).
    - They can be **accumulated in the body easily and cannot be detoxified** by any chemical or biological processes.
- This study demonstrates the easy detection of heavy metal ions in water. However, **strategies are being developed to improve the selectivity of the detection.**

Centre for Nano and Soft Matter Sciences

- It is an **autonomous research institute** under the **Department of Science and Technology (DST),** Government of India.
- DST provides **core support** to the Centre in the form of a **grant-in-aid for conducting basic and applied research** in nano and soft matter sciences.
- CeNS is located at **Jalahalli, Bengaluru.**
- It is being mentored by **Nano-Mission** of the Government of India.
- It is **engaged in materials research** at all relevant length scales.
    The current activities are focussed on a variety of metal and semiconductor nanostructures, liquid crystals, gels, membranes and hybrid materials.
- The Centre was **established in 1991** by an **eminent liquid crystal scientist, Prof. S. Chandrasekhar, FRS.** After years of expansion and name changes, in **2014,** it became the **Centre for Nano and Soft Matter Sciences** (CeNS).

Nano Mission

- It was **launched in 2007** as an **umbrella capacity-building programme** by the Government of India.
- It is being implemented by the **Department of Science and Technology.**
- **Objectives:**
    - Basic research promotion.
    - Infrastructure development.
    - Nano applications and technology development.
    - Human Resource development.
    - International collaborations.
- The Nano Mission has established national dialogues to promote R&D in the development of standards for nanotechnology and for laying down a **National Regulatory Framework Road-Map for Nanotechnology (NRFR-Nanotech).**

Source: PIB