Reusable Water Filter with Light and Vibration

Prelims *- Current events of National & International importance and General Science.*

Why in News?

Recently, Scientists from the Institute of Nano Science and Technology (INST) in Mohali, IIT-Dharwad, and IIT-Kharagpur have designed a cheap reusable water filter.

- **Need -** Dyes such as Congo Red and Methylene Blue are industrial pollutants released into rivers and groundwater causes stomach, skin, and breathing illnesses.
- **Exiting filtering methods -** These are costly and having higher foot print as they burn through chemicals and electricity.
    - **For example -** Ozone, Fenton chemistry and other methods work to clean the water.
- **Filter specification -** First 3D printed thin, sponge-like sheets of ***polylactic acid (PLA)***, **a *biodegradable plastic*** often used in compostable cups.
- PLA is naturally water-repelling, So that it was soaked in a mild sodium-hydroxide solution to make it water-loving.
- **Made up of -** Nanoparticles of *bismuth ferrite (BFO)* and dipped the prepared PLA sheets into a BFO ink.
- The treated sheets stayed strong through five reuse cycles, losing only about 3% of their cleaning power.
- **Mode of operation -** Combining *both light and vibration yielded piezo-photocatalysis*, a process that worked day or night.
- **Components –**
    - **Visible light -** Under it, BFO acted like a solar-powered catalyst that split water molecules and created highly reactive radicals that shred organic dye molecules.
    - **Ultrasound shaking -** BFO's piezoelectric nature generated an internal electric field that drove the same radical-making reactions even in the dark.
- **Working -** When light and vibration were used together, the filter removed about 99% of Congo Red and 74% of Methylene Blue in 90 minutes.
    - It also partially cleaned real wastewater collected from a textile plant.
- **Capability** –Tto understand performance the computer fed by thousands of experimental data points, including dye concentration, catalyst amount, light intensity, and ultrasound frequency.
- Modern algorithms such as random forests, XGBoost, and an artificial neural network are used and got results far beyond the experimental ones.
- **Deployment –** At near treatment plants.
- **Developments underway** - For its use in Jal Nigam and Namami Gange projects as

well.
- Efforts are underway to make this product more sustainable using plant-derived products.

Reference

[The Hindu| Reusable Water Filter with Light and Vibration]