

## Synthesis of hydrogen peroxide

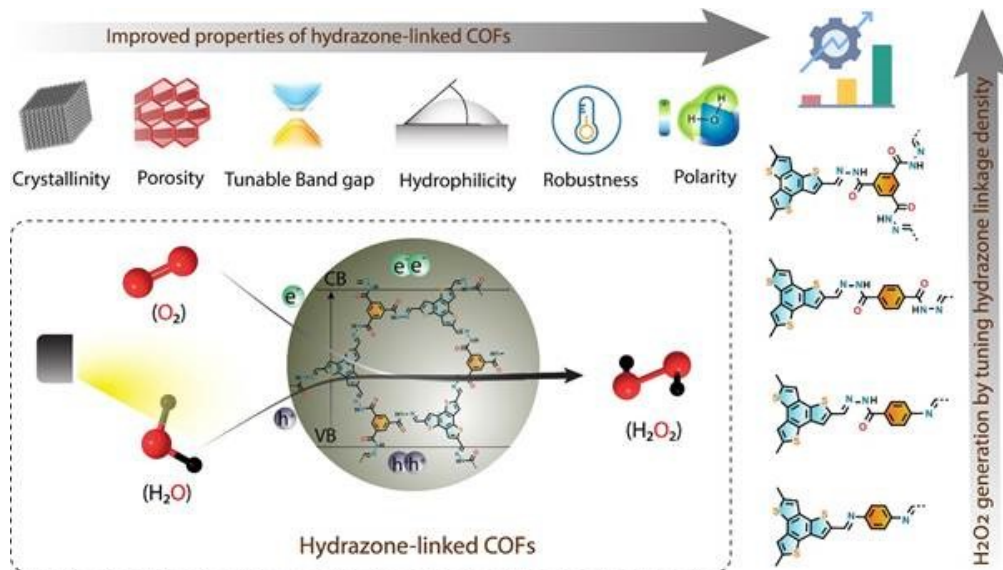
### Why in News?

*Researchers have found an efficient, less energy-intensive, and environmentally friendly way of synthesizing hydrogen peroxide.*

- Currently, over 95% of  $\text{H}_2\text{O}_2$  is produced industrially using the **anthraquinone oxidation process**.
  - It is very energy intensive, expensive and produces many hazardous chemicals as by-products.
- **Recent Findings** - Scientists discovered a new class of porous and ordered polymers with modifiable catalytic sites and light-harvesting properties in visible range, called covalent organic frameworks (COFs).
- It have emerged as promising photocatalysts.
- **Done by** - S. N. Bose National Centre for Basic Sciences, Kolkata, an autonomous institute under the Department of Science and Technology (DST).
- They have designed and prepared a series of COFs having good water affinity through careful control of the hydrazone linkage density.
- They also studied their effect on the photocatalytic performance for  $\text{H}_2\text{O}_2$  generation.
- It was observed that the hydrazone-linked COFs provide abundant docking sites for water and oxygen, thereby promoting 2 main pathways for photocatalytic  $\text{H}_2\text{O}_2$  generation
  - Water oxidation reaction (WOR) and
  - Oxygen reduction reaction (ORR)
- As a result, the hydrazone-linked COF exhibited exceptional photocatalytic  $\text{H}_2\text{O}_2$  production without external sacrificial electron donors when irradiated with a 40 W blue LED ( $\lambda = 467 \text{ nm}$ ).
- Interestingly, a significant amount of  $\text{H}_2\text{O}_2$  ( $550 \mu\text{mol g}^{-1} \text{ h}^{-1}$ ) was also produced under sunlight irradiation.
- It outperforms most organic photocatalysts under similar conditions, thus demonstrating a clean and sustainable pathway.
- Furthermore, as-synthesized hydrazone-linked COFs can generate  $\text{H}_2\text{O}_2$  up to  $21641 \mu\text{mol g}^{-1} \text{ h}^{-1}$  using an aqueous benzyl alcohol solution by preventing the degradation of  $\text{H}_2\text{O}_2$ .

*Aqueous benzyl alcohol consists of (water: benzyl alcohol = 90:10)*

- This strategy will be helpful in developing a continuous flow reactor for the sustainable production of  $\text{H}_2\text{O}_2$  and will reveal a laboratory-to-industry technology transfer for the benefit of mankind.



## Hydrogen peroxide ( $H_2O_2$ )

- It is a chemical, versatile oxidizing agent widely used in environmental disinfection, chemical synthesis, paper bleaching, and fuel cells.
- **Significance** - Driven by the increasing awareness of disinfection, the rise in the number of surgeries, and the prevalence of hospital-acquired infections.

## References

[PIB | Hydrazone-linked COFs](#)