Hydrogen Flames: From Orange Glow to Near Invisibility

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Why in news?

Researchers at Adelaide University have now identified a surprising reason for the dramatic colour change of hydrogen flames from bright orange to nearly invisible.

- **Hydrogen burn** – Pure hydrogen burns with a pale blue, nearly invisible flame in daylight, so an initial orange glow usually comes from trace contaminants burning off.
- Once those impurities are consumed, the flame reverts to its true, low-visibility colour.
- **Reason for the flame's colour change** – Higher sodium concentration in the air makes the hydrogen flame glow brighter orange.
- Lower sodium concentration makes the flame become faint or almost invisible.
- Air masses that travel over the ocean usually contain more sodium, enhancing flame visibility.
- **Key findings of the study** – Over a two-week monitoring period, sodium-related light emissions from hydrogen flames varied by more than 28 times, even under identical operating conditions.
- Hydrogen flames emitted less visible light than conventional natural gas flames under comparable conditions.
- Hydrogen combustion can produce faint blue and red light, but these colours are difficult to detect under normal daylight conditions.
- **Safety Implications** – Hydrogen flames may not always be visible to the human eye, increasing safety concerns for household appliances.
- Researchers recommend using
    - Ultraviolet (UV) flame detectors
    - Infrared (IR) flame detectors
    - Temperature sensors
    - instead of relying solely on visible flame colour.
- **Significance** – The findings can help engineers design safer hydrogen-powered stoves, ovens, and domestic appliances as countries explore hydrogen as a low-emission alternative to natural gas.

Reference

Science Daily | Why hydrogen flames can glow orange, then turn nearly invisible



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