

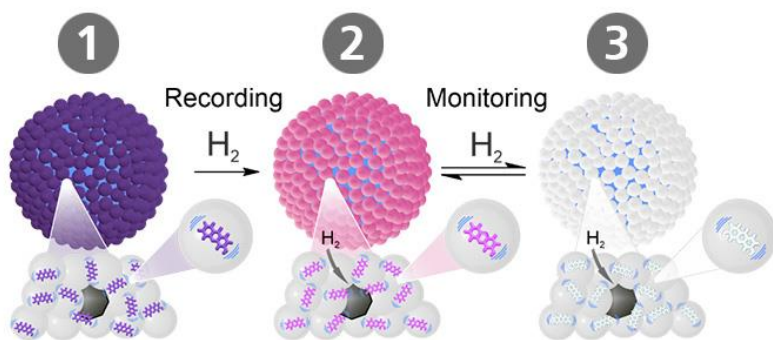
H₂ Indicator Supraparticles (H₂ Sensor)

[Smart additives for a safe hydrogen economy]

Green hydrogen produced from renewable energy sources will be a key component of a sustainable and climate-friendly energy economy in the future. In particular, the safety aspect is a major challenge for the realization of a hydrogen economy. Hydrogen gas, which will be used almost everywhere as a flexible energy carrier, cannot be perceived by the human senses. However, it is highly flammable and explosive in air. In order to increase safety within the complex hydrogen infrastructure, researchers at the Fraunhofer Institute for Silicate Research ISC in Wuerzburg have investigated the basic functional mechanisms for a new type of hydrogen sensor.

The patented hydrogen indicator consists of inexpensive, microscale particles, so-called supraparticles. Without electricity and complex measuring equipment, this makes invisible hydrogen visible to the bare eye. Hydrogen indicators can detect highly specific even low concentrations of the gas, e.g., in the event of leaks in a gas pipeline, so that appropriate measures can be initiated.

The smart indicator particles offer irreversible as well as reversible color changes.



LEVEL 1 (purple): Original condition before contact with H₂.

LEVEL 2 (pink): Upon first contact with H₂, the particles initially show an irreversible color change reaction (recording) within seconds.

LEVEL 3 (colorless): Upon further exposure to H₂, a reversible color change reaction takes place (monitoring). As soon as no more H₂ is present, the color switches back to stage 2 within seconds.

Benefits of hydrogen detection by supraparticles:

- Reliable even at **low H₂ concentrations**
- **Real-time indication** enables fast leak detection
- Recording of hydrogen exposure enables **precise leak localization**
- **No power supply necessary** and therefore no ignition source as risk factor (explosion protection)
- **No complex measurement technology** required
- **Versatile use and application:** Additive for paints, directly sprayable, for large areas, inaccessible areas, safety equipment and many more
- **Adaptable for other gases**
- **Coupling with optical sensors or safety systems** possible (remote sensing)

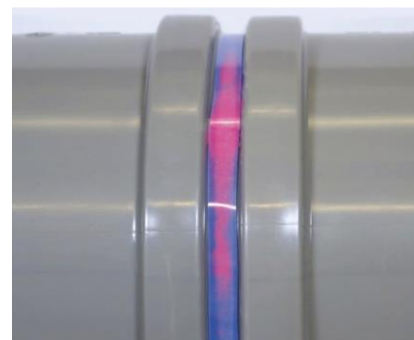


Image: Intelligent seals with color change in case of leakage problems e.g. for flanges - Smart gasochromic additive makes H₂ visible for the bare eye

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Thanks and Regards,

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