SCIC
SINGAPORE CHEMICAL INDUSTRY COUNCIL

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# PreDigest

## Hydrogen ($H_2$) Safety

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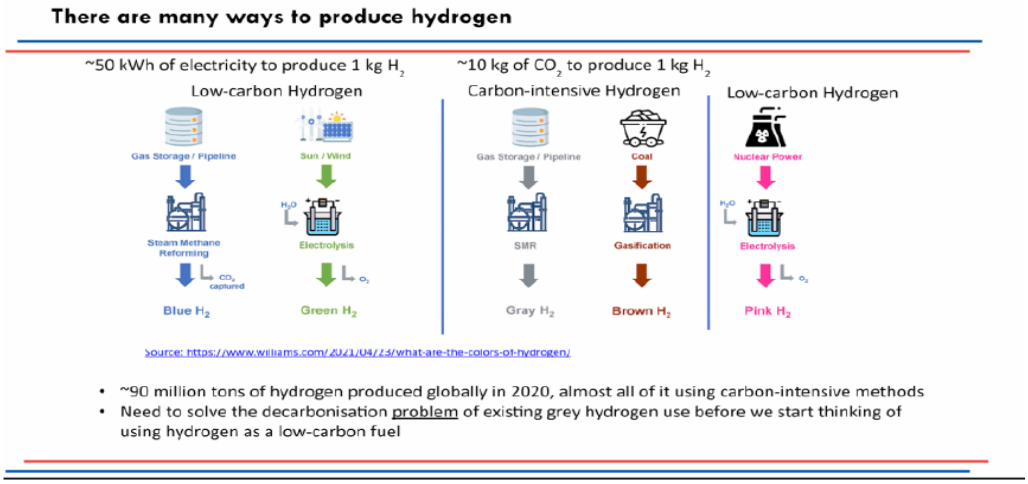
OUR COMMITMENT TO SUSTAINABILITY

**Hydrogen(H2)** has been gaining a lot of attention lately as an alternative solution to fossil fuels. Though Hydrogen is colourless, labelling is done in varies colour depending on how they are produced: Blue, Green, Grey, Brown & even Pink!




https://www.williams.com\2021\04\23\what-are-the-colors-of-hydrogen

### Many Uses of Hydrogen

H2 is used in many industrial processes e.g., refining petroleum, treating metals, producing fertilizer and processing food. Refineries use Hydrogen to lower the Sulphur content of fuels. Hydrogen fuel cells produce electricity and supply electricity to electric power grids, supply backup or emergency power in buildings, and supply electricity in places that are not connected to electric power grids. Light duty Hydrogen fuel cells are installed in vehicles as alternative fuel to gasoline or diesel.

### Is Hydrogen Safe?

To discuss the safe use of Hydrogen, we must first look at its properties:

1. **Non-Toxic:** H2 do not pose harm to human, except for asphyxiation. H2's buoyancy and diffusivity make it unlikely to be confined where asphyxiation might occur.

2. **Low Molecular Weight & Low Viscosity**: H2 has high propensity to leak, even permeate through or into various materials. Selection of material of construction for H2 services is important. (See ref #1)

3. **Light weight**: H2 is 8 times lighter than LNG, 14 times lighter than air and 57 times lighter than gasoline
   H2 will rais and dissipate quickly when it is released, allowing for relatively rapid dispersal in case of a leak.

4. **Wide flammability range** (4-74% in air) and **Low Ignite Energy** (0.02mJ): this means that it can ignite easily.
   Because a Hydrogen fire doesn't radiate as much heat as most fires do, it is less likely to cause secondary fires.
   The Hydrogen flame will be burning "upright" due to low density of the gas, as demonstrated by the video below.

*Watch "H2 vs Gasoline Leak & Ignition Test – which is safer? by Dr. Michael Swain, University of Miami, 2001.
(https://www.youtube.com/watch?v=OA8dNFiVaF0)

**Hydrogen** can be handled safely if the user understands its behaviour and follows safety guidelines.

Ref#1 – "Hydrogen Piping Systems: Mitigating Pitfalls by Design" – William M. Hutt, Chemical Engineering, August 2021

Process Safety is Everybody's Responsibility!

An initiative of the Process & Engineering Committee

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