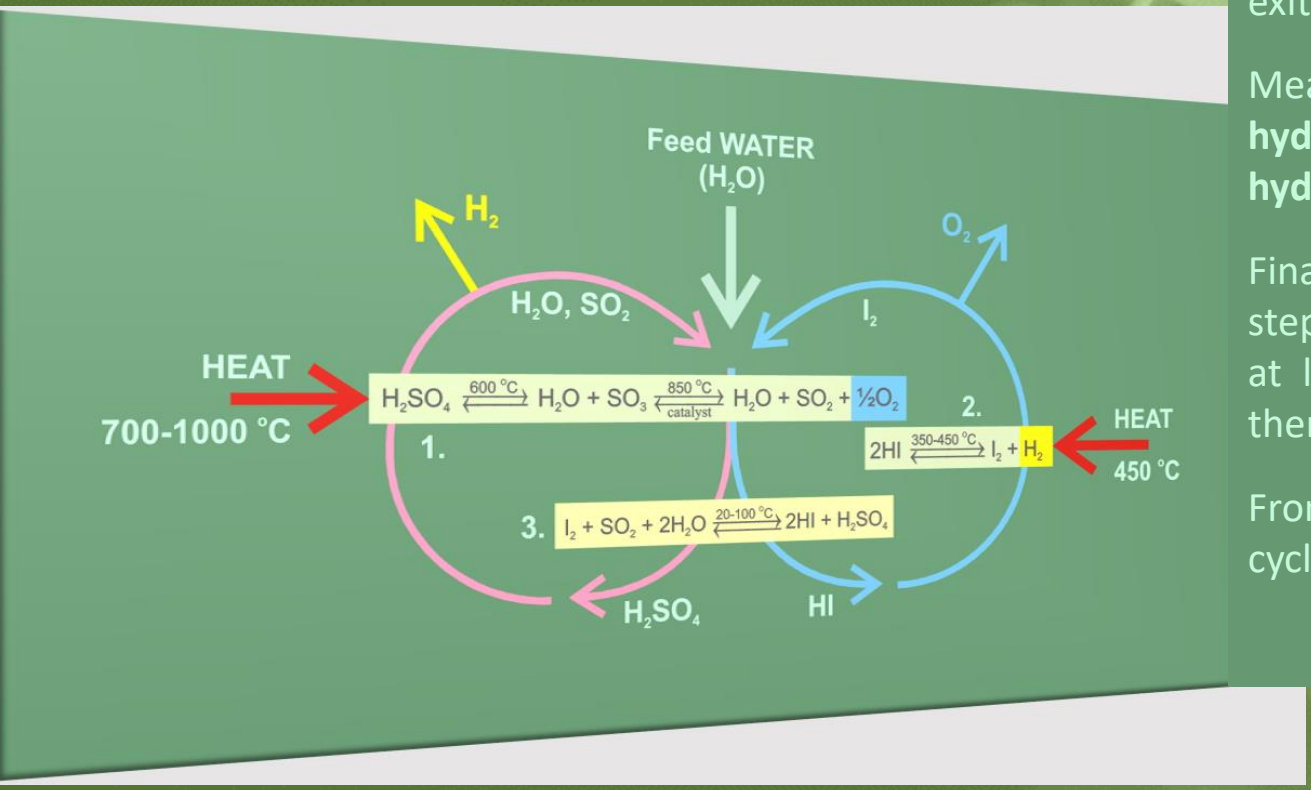
THE SULFUR-IODINE (SI) THERMOCHEMICAL WATER-SPLITTING CYCLE



Several different thermochemical concepts for hydrogen production from water have been explored in recent decades, but the most extensively studied is the **SULFUR–IODINE (SI)** cycle. This cycle is considered the most suitable option because it offers the highest efficiency among the proposed methods and operates at temperatures below 1000 °C. Its schematic diagram is shown in the figure.

As illustrated, **sulfuric acid (H_2SO_4)**, one of the reactants, undergoes a two-step decomposition at high temperatures, releasing **oxygen** that exits the system (reaction 1).

Meanwhile, at similarly elevated temperatures, the second reactant—**hydrogen iodide (HI)**—decomposes (reaction 2), producing **iodine** and **hydrogen**. The hydrogen is released as the desired product.

Finally, in reaction 3, the two products of the previous decomposition steps react with **water**, which is the input material. This reaction occurs at low temperatures and regenerates the original reactants, making them available for the next cycle.

From these reactions, it follows that the net effect of the three-stage SI cycle is the decomposition of water into hydrogen and oxygen:

$$H_2O \rightarrow H_2 + ½O_2$$