Synthesizing Renewable Energy from Water Using Sunlight

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Solar energy is clean and free, and in abundance. Fossil fuel consumption is growing globally at an unstainable rate, and there is a need for renewable, nonpolluting sources of energy. Newer technologies are being developed to use the Sun's light energy to split water into hydrogen and oxygen and is considered the most inexpensive way to generate hydrogen. Hydrogen produced from water using Sunlight and specialized semiconductors (nanomaterials) is called photocatalytic water splitting. Bismuth vanadate ($BiVO_4$), Titanium dioxide (TiO_2), Tungsten trioxide (WO_3), and Hematite (Fe_2O_3) are metal oxides extensively used in photocatalytic water splitting. I tested the combination of metal oxide nanostructured materials (Bismuth nitrate, Vanadium oxide, Cobalt (III) acetate, and Cobalt (II) nitrate hexahydrate) coated on a fluorine-doped tin oxide glass to split water, focusing on achieving efficiency. I also tested durability to determine which of the combinations works better in the long run. I observed Bismuth vanadate produced more hydrogen during initial testing than other bismuth vanadate + cobalt acetate and bismuth vanadate + cobalt nitrate + cobalt acetate semiconductors. When tested for durability, the latter two combinations were efficient than bismuth vanadate alone. Solar water splitting has been considered the most effective and cleanest way to produce hydrogen. The hydrogen produced can then be used by fuel cells to generate electricity, where water constitutes the only emission.

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