Title:

Cobalt Oxide nanomaterial over MoS2 quantum dots as a heterojunction photocatalyst for water splitting.

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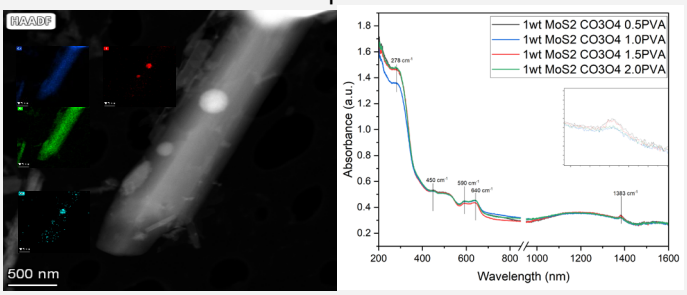
In our study we have designed a Surface Plasmon Resonance (SPR) incorporated cobalt tetraoxide (Co_3O_4) photocatalyst to achieve water splitting reaction to produce hydrogen and oxygen. Cobalt tetraoxide has enormous active sites, stability, and band gap tunability by adjusting the synthesis process so it has grabbed attention. Our research focuses on synthesising Cobalt tetraoxide using a rapid, microwave irradiation technique at 200ºC at 900 watts.

A series of Cobalt tetra oxide was made using varying wt% of Polyvinyl alcohol. Later, SPR effect on the Co_3O_4 is incorporated by Molybdenum disulfate quantum dots (200ºC at 900 watt) to enhance Cobalt tetraoxide light absorption and charge separation, in order to further improve the water splitting efficiency.

TEM imaging tells us the morphology of the sample is rod like and edx analysis shows that MoS_2QD, spares are attached on the surface of the rod. UV Vis NIR data suggests, the light absorption range is high and broad from UV to Visible light spectra. 700nm to 1000nm is a dip but later in the NIR the sample shows excitation. We assume that is due to the SPR effect.



Without the use of sacrificial agent we successfully achieved a hydrogen evolution reaction with a rate of 0.00178 and 0.00207 μmol $g^{-1}h^{-1}$ that is 17.9 and 24.1 time higher than pure cobalt oxide and commercial Co_3O_4 sourced from Sigma Aldrich.

Now the objective is to integrate this photocatalyst over the flat disk shaped membrane, coat the photocatalyst using a dip coater, and investigate the hydrogen performance of this