NANOSCIENCE COLLOQUIUM

Thin Film and Particle Based Solar Water Splitting with Low-Cost Inorganic Materials

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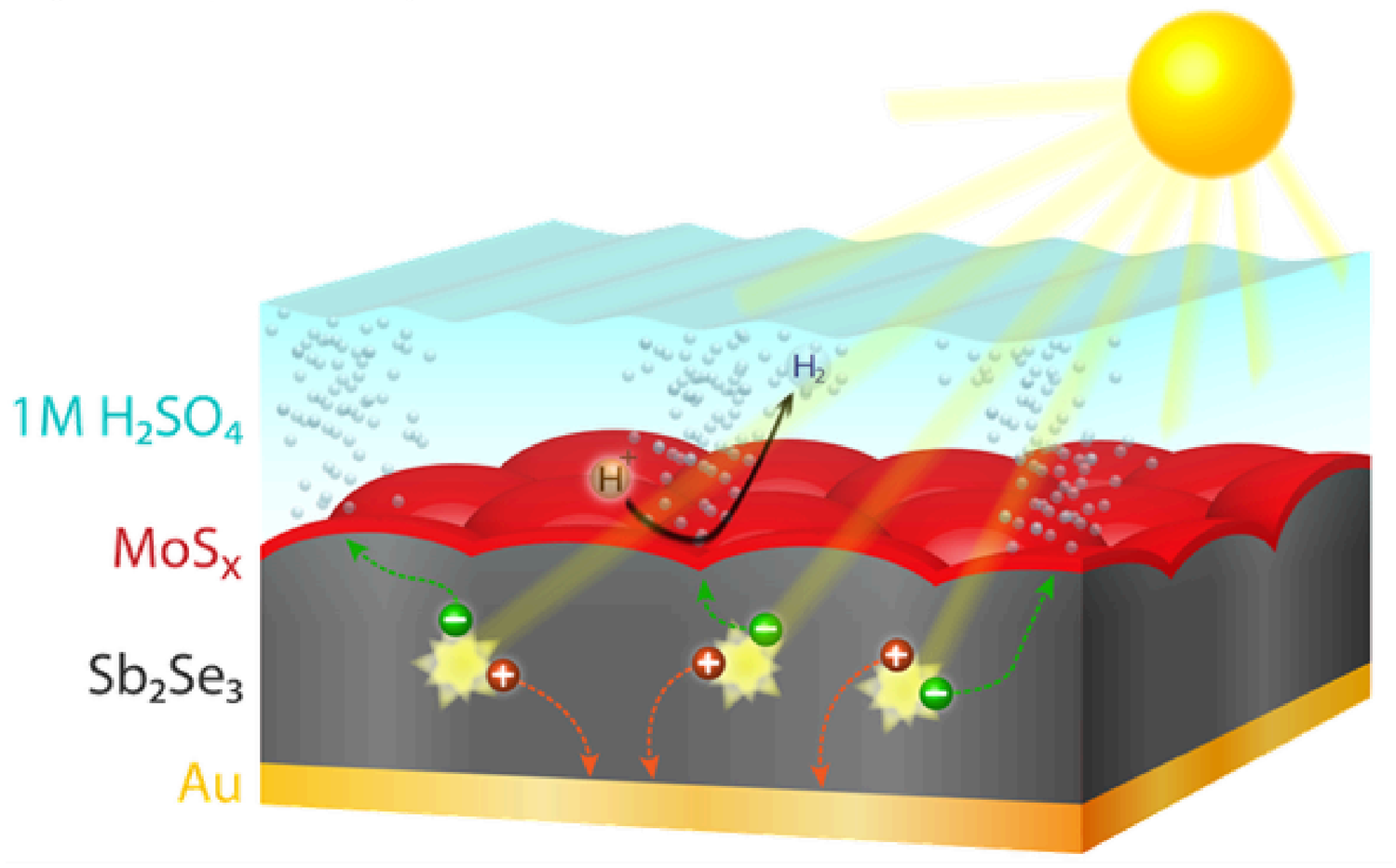
ABSTRACT:Particle-based water splitting is considered to have disruptive potential for generating green hydrogen if certain efficiency and stability goals are met. While the required efficiency and durability metrics to be economically competitive are much higher for thin film-based systems, the thin film architecture enables the use of advanced characterization techniques for improvement of the materials, which in a second step can be translated to the more cost-effective particle architecture. In this talk, I will discuss our recent work with cuprous oxide (Cu_2O), both as a photocathode for hydrogen evolution as well as a photoanode for water oxidation, and antimony selenide (Sb_2Se_3) systems for hydrogen evolution. I will discuss a novel protective layer for photoanodes composed of a polyamine embedded in a TiO_2 layer that not only conducts holes but also serves as a selective contact for holes on the model systems $BiVO_4$ and Fe_2O_3. Finally, I will describe our recent efforts for translating these systems to particle-based architectures, where we observe gas evolution with light input only.



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