Effect of Electrolyte on the Selectivity and Stability of n-type WO_3 Photoelectrodes for Solar Water Oxidation Reaction

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Tungsten oxide is an n-type semiconductor with an indirect band gap of 2.7 eV. It is inexpensive, environmentally benign, and resistant to photo-corrosion in acidic conditions. Therefore, it is an excellent candidate for use as a photoanode to evolve O_2 for photoelectrochemical water splitting.

However, depending on the pH and composition of the electrolyte, other photo-oxidation reactions that compete with O_2 evolution can occur at the WO_3/electrolyte interface, lowering the efficiency of solar oxygen production and affecting the photo-stability of the WO_3 electrode. To address this issue, we evaluated the photocurrent to oxygen conversion efficiency of WO_3 electrodes in various electrolytes. In this poster, photo-oxidation reactions occurring in electrolytes containing the anions acetate, chloride, perchlorate, phosphate, or sulfate at various pHs will be discussed in a quantitative manner. Additionally, the effect of cations (Li^+, Na^+, and K^+) on the O_2 evolution reaction will be discussed.