α-Fe_2O_3 NANOWIRE ARRAY BASED ELECTRODES FOR SELF-DRIVEN PHOTOELECTROCHEMICAL CELLS

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Iron oxide, Fe_2O_3, is a promising material for water splitting reaction using solar energy due to its stability and optimal bandgap of 2 eV.[1,2] Even the recent efforts, however, using Fe_2O_3 thin film materials reported low efficiencies due to poor carrier transport within these films.[3,4]

Recently, we developed a novel method to synthesize arrays of α-Fe_2O_3 nanowires, which are single crystal and have highly ordered oxygen vacancy planes (see Fig. 1 and 2).[5,6] As one-dimensional nanostructures, these nanowires offer many other benefits to PEC electrolysis, such as high surface area, reduced charge carrier diffusion distance, and a preferential direction for charge diffusion. Furthermore, due to the ordered-oxygen vacancy planes in these nanowires, the resistivity that has plagued this material may become a non-issue.[7]

In preliminary investigation of as-synthesized a-Fe_2O_3 nanowires, photoluminescence and optical absorbance measurements confirmed a bandgap energy of 2.1 ± 0.05 eV (see Fig. 3 and 4).

In this poster, we will discuss both synthesis and photoelectrochemical properties of a-Fe_2O_3 nanowire arrays grown on Fe foils.

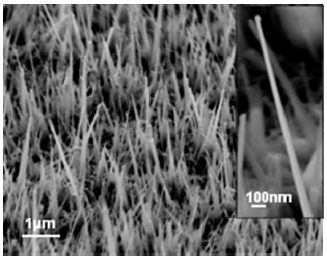

Fig. 1

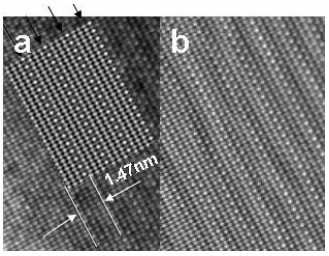

Fig. 2

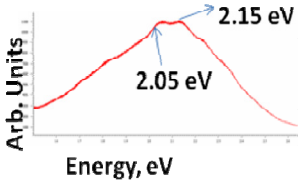

Fig. 3

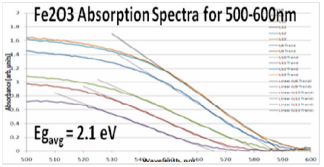

Fig. 4

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