Composition tuning of p-type Cu_2O photocathode for use in photoelectrochemical cells

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Cu_2O is one of the few p-type semiconductors that can serve as a photocathode to evolve H_2 in a photoelectrochemical cell used to split water because of its proper band positions and bandgap energy. In order to enhance the photoelectrochemical properties or stability of Cu_2O, electrochemical synthesis of Cu_2O was carried out using electrolytes that contain various trivalent cations. The resulting compounds can either be Cu_2O doped with the M^{3+} cation or a ternary compound ($CuM(III)O_2$) with a delafossite structure. Since delafossites are stable under light irradiation and exhibit p-type photoactivity, they can also be excellent candidates for use as photocathodes.

In this poster, we will present the results obtained from adding trivalent Gallium, Yttrium, and Ytterbium to the electrolyte solution during electrochemical synthesis of Cu_2O. Their compositions and properties will be discussed in detail.