Water -Splitting Photoelectrochemical Diodes

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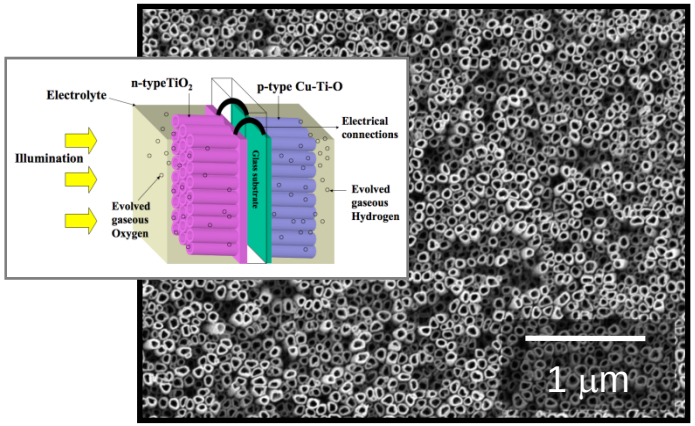

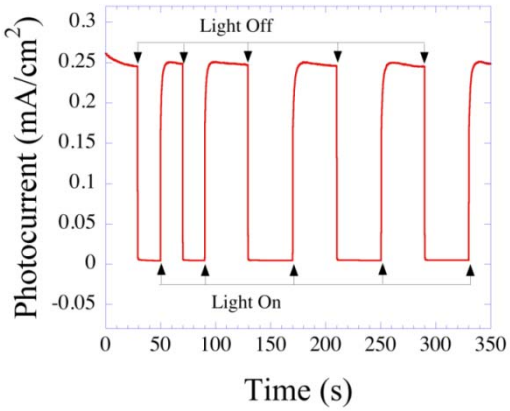

Water-splitting photoelectrochemical *p-n* heterojunction diodes are being fabricated using *p*-type Cu-Ti-O nanotube array films in combination with *n*-type TiO_2 nanotube array films. The vertically oriented 1 μm thick *p*-type Cu-Ti-O array films are produced by anodization of copper rich (60% to 74%) Ti metal films co-sputtered onto fluorine-doped tin oxide coated glass.

With the glass substrates oriented back-to-back, light is incident upon the UV absorbing *n*-TiO_2 side, with the visible light passing to the *p*-Cu-Ti-O side. Photocatalytic reactions are powered only by the incident light to generate fuel with oxygen evolved from the *n*-TiO_2 side of the diode and hydrogen from the *p*-Cu-Ti-O side.

e.g., G. Mor, *et al., Nanoletters*, 8, 1906 (2008).

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Under global AM 1.5 illumination, photocorrosion-stable heterojunction *n*-TiO_2 and *p*-Cu-Ti-O diodes generate a photocurrent of ~ 0.25 mA/cm^2, at a photoconversion efficiency of 0.30%.