Efficient Photon-harvesting Technologies for Water Splitting Reactions

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Metal oxide nanostructures with hetero-contacts and phase boundaries offer unique platform for designing materials architectures for energy harvesting applications. As viable alternative to water electrolysis, photoelectrochemical (PEC) water splitting has emerged as a competitive technology being capable of converting solar energy directly into chemical energy using stable and efficient photocatalysts for solar hydrogen production. Besides the size and surface effects, the modulation of electronic behaviour due to junction properties leads to modified surface states that promote selective decomposition of analytes and adsorbates. The growing possibilities of engineering nanostructures in various compositions (pure, doped, composites, heterostructures) and forms has intensified the research on the integration of different functional material units in a single architecture to obtain new photocatalytic materials. Even though the potential of hematite thin films for water splitting applications are widely accepted, researchers are still tackling the 'rust challenge'. We report here on the influence of external magnetic fields applied parallel or perpendicular to the substrate during plasma enhanced chemical vapor deposition of hematite (α-Fe_2O_3) nanostructures. Hematite films grown from iron precursors showed pronounced changes in crystallographic textures depending upon whether CVD was performed with or without external magnetic field.

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