TiO2 thin layer on P-Si for efficient and pH independent photo catalytic water splitting.

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Hydrogen fuel cells, being environmental friendly to produce energy, are a technology of future. The most efficient way to produce hydrogen is solar driven photocatalysis using semiconducting materials as photo electrodes. The choice of electrodes is a crucial factor and is done on the basis of photo corrosion stability, light absorption efficiency, and photocarrier lifetime.

P-type Si can be used as photo cathode to produce H2 by direct photocatalysis. Si cathodes can be used in acidic electrolytes to have efficient photo catalytic activity but they are unstable in alkaline electrolytes. Therefore, to use both Si electrodes in the same electrolyte, their chemical stability should be extended over a wide range of pH. To this purpose we modified the surface of a p-type Si photocathode with very thin films of TiO2 grown by atomic layer deposition (ALD). We found that the modified Si cathode shows an increased photoresponse and a lower onset potential with respect to the pristine surface. Furthermore, in contrast to bare P-Si our TiO2/P-Si exhibits stability against photocorrosion at various pH values.