

Enhancement in solar hydrogen generation efficiency using a GaN-based nanorod structure

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A significant enhancement in solar hydrogen generation has been achieved using a GaN-based nanorod array structure as a photoelectrode in comparison with a planar one fabricated from the same parent wafer. The nanorod array structure was formed by dry etching using a self-organised nickel nanomask. Under identical illumination conditions in hydrochloric acid solution, the photoelectrode with the nanorod array structure has demonstrated a photocurrent enhancement with a factor of 6 and an enhancement in the rate of hydrogen generation with a factor of 7. The enhancement in solar hydrogen generation is attributed to a massive improvement in light absorption area, reduced travelling distance for the migration of the photogenerated carriers to the semiconductor/electrolyte interface, and surface band bending.

[Applied Physics Letters](#) / [Volume 102](#) / [Issue 17](#) / [ENERGY CONVERSION AND STORAGE](#)

Appl. Phys. Lett. **102**, 173905 (2013); <http://dx.doi.org/10.1063/1.4803926>