



## Design and Synthesis of Green Energy Materials with Hierarchical Nanostructures

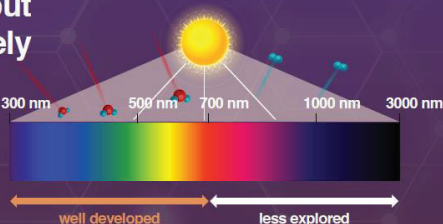
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<http://researchmap.jp/chunyichen>

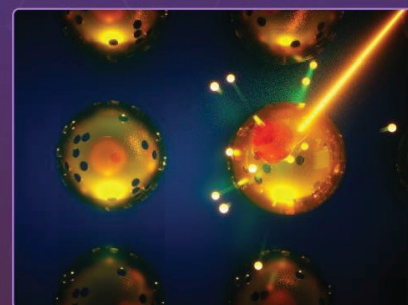
### Main Research Fields

- Dual-Plasmonic photocatalysts for hydrogen production across visible to near infrared region
- Hydrothermal synthesis of hierarchical heterostructures for Li-ion batteries materials
- Structural and compositional control of nanotubes by anodization

Near infrared (NIR) energy from sunlight can benefit solar hydrogen ( $H_2$ ) production, but remains largely untapped.



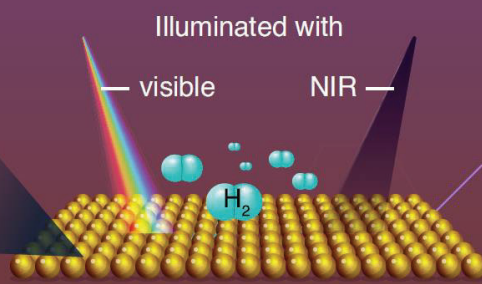
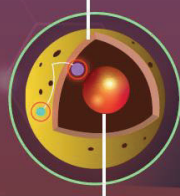
Both Au and  $Cu_7S_4$  exhibit localized surface plasmon resonance that can harvest photons from visible to NIR region.



### Remarkable $H_2$ production over Au@ $Cu_7S_4$ yolk@shell nanocrystals

Shell provides active sites.

Yolk promotes charge separation.



Au@ $Cu_7S_4$  yolk@shell nanocrystals



Long-lived charge separation states facilitate  $H_2$  production

500 nm  
Peak quantum yield: 9.4 %

2200 nm  
Record-breaking quantum yield: 7.3 %



Unprecedented visible and NIR photoactivity



No co-catalysts needed

**This broad-spectrum-responsive photocatalytic system can pave the way for the development of cutting-edge solar fuel generation technologies**