

# Supporting Information

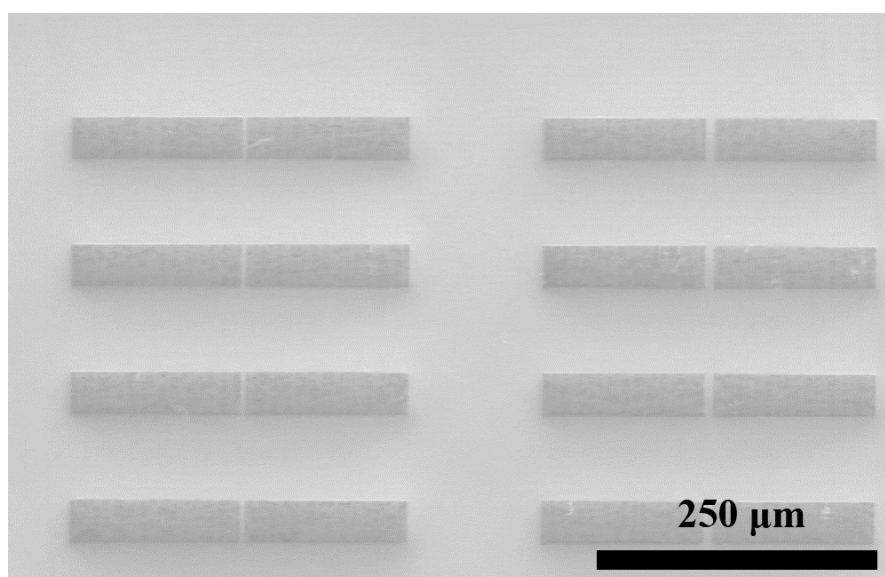
## Ultrathin All-2D Lateral Graphene:GaS:Graphene UV Photodetectors by Direct CVD Growth

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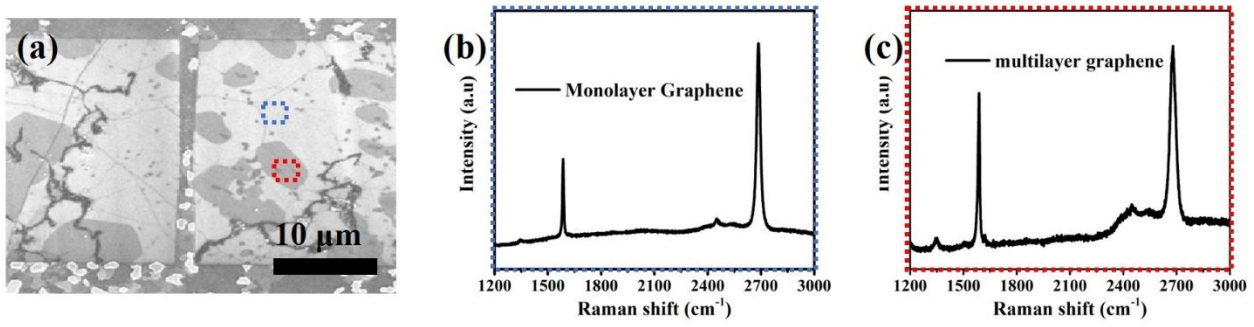
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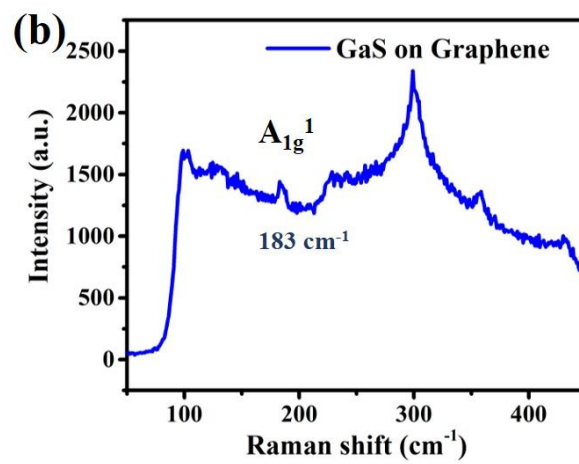
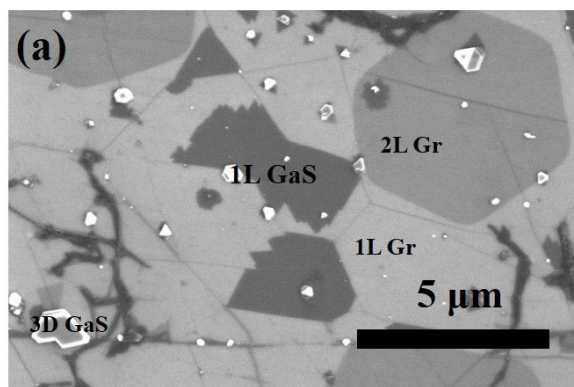
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**Figure S1. SEM image of as patterned graphene electrode pair array**



**Figure S2. Raman spectra of graphene of Gr/GaS/Gr heterostructures** (a) SEM image of a Gr/GaS/Gr photodetectors made by CVD growth on pre-patterned graphene gap; (b) Raman spectrum of graphene in highlighted area (blue); (c) Raman spectrum of graphene in highlighted area (red).



**Figure S3. CVD growth of GaS on graphene substrate.** (a) SEM image of GaS CVD grown on graphene substrate.

(b) Raman spectrum of GaS grown on graphene substrate.

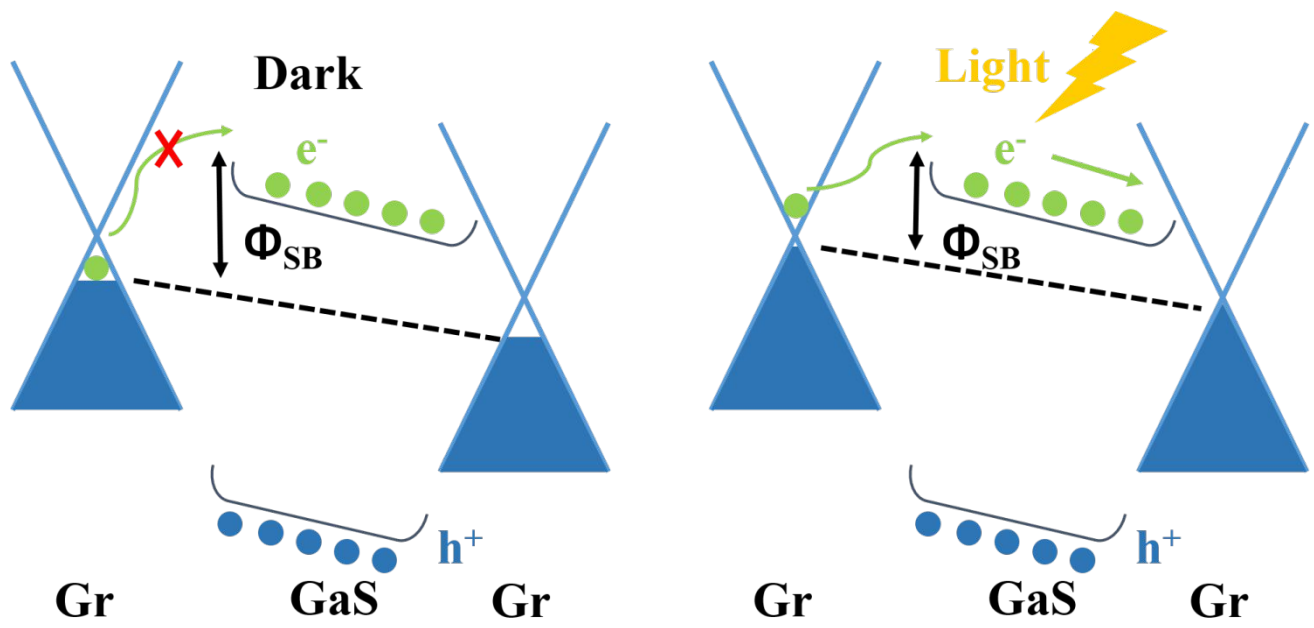


Figure 4S. Band diagram of graphene:GaS:graphene heterojunction under dark and illumination