Academic Writings and Presentations

Paragraphs

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Paragraph Structures

- Problem-Solution
- General-Specific
- Specific-General
- Classification
- Narration
- Definition
- Comparison-Contrast
- ...

Problem-Solution

- Situation
  - Definition, Introduction, Background, ...
- Problem
  - Current status, Challenges, Limitations, ...
- Solution
  - Methods, Experiments, Theories, ...
- Evaluation
  - Results, Feedbacks, Impacts, Outcomes, ...

Commonly used for abstract / introduction / summary

Problem-Solution

Optical upconversion that converts infrared light into visible light is of significant interest for broad applications in biomedicine, imaging and displays. Conventional upconversion materials rely on non-linear light-matter interactions, exhibit incidence dependent efficiencies and require high power excitation. We report an infrared-to-visible upconversion strategy based on fully integrated microscale optoelectronic devices. These thin-film, ultra-miniaturized devices realize near-infrared (~810 nm) to visible (630 nm red or 590 nm yellow) upconversion that is linearly dependent on incoherent, low-power excitation, with a quantum yield of ~1.5%. Additional features of this upconversion design include broadband absorption, wide emission spectral tunability and fast dynamics. ... This approach provides a versatile route to achieve upconversion throughout the entire visible spectral range at lower power and higher efficiency than has previously been possible.

H. Ding, *et al.*, *PNAS* **115**, 6632 (2018)

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Problem-Solution

Our farmers' market is in danger of closing because a building is going to be constructed in the empty lot where it has been held for the past ten years. Since the market is such an asset to our community, a committee formed to look for a new location. The first idea was to close a street off for a few hours each Saturday morning. Unfortunately, the city manager nixed that idea since he believed that too many people would complain. Barry Moore suggested that the market could be held in the state park that is just a few miles out of town. Again, a government worker struck down the idea. This time, the problem was that for-profit events are not allowed in state parks. Finally, I came up with the perfect idea, and our government blessed the idea. Since the high school is closed on Saturday, we will be having the market in the school parking lot.

https://courses.lumenlearning.com/englishcomp1v2xmaster/chapter/comparative-chart-of-writing-strategies/

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General-Specific

- General summary
- Detail 1
- Detail 2
- Detail 3
- ...

Commonly used for abstract / introduction / discussion / summary

General-Specific

This paper describes concepts with demonstrated ability to bypass many of the limitations of these and other previously explored technologies. Here, printing-based methods enable high-speed physical assembly of arrays of stacked, microscale MJ solar cells using high performance materials removed from growth wafers via an epitaxial liftoff process. A unique, infrared transparent and refractive-index matched layer of a chalcogenide glass (arsenic triselenide, As2Se3) serves as a thermally conductive and electrically insulating interface layer in these stacks. Unusual packaging techniques, electrical matching networks and telescoping focusing lenses yield modules that exploit the resulting MJ cells to achieve efficiencies of 38.5%, under one sun illumination.

X. Sheng, *et al.*, *Nature Materials* **13**, 593 (2014).

General-Specific

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Specific-General

- Detail 1
- Detail 2
- Detail 3
- ...
- General summary

Commonly used for abstract / introduction / summary

Specific-General

Concepts presented here demonstrate materials and device strategies for highly efficient infrared-to-visible upconversion. Moving forward, advanced surface treatments and optical coatings can immediately lead to higher upconversion efficiencies. Integrations of other semiconductors could explore excitation and emission at other wavelengths. In addition, advanced fabrication approaches can be utilized to achieve further miniaturized devices. Combining with light sensitive receptors or drugs, these miniaturized devices can also be applied to deep tissue light stimulation or therapy. These results provide new routes for high performance upconversion materials and devices.

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Narration

- Step 1
- Step 2
- Step 3
- ...

Commonly used for experiments / methods

Narration

Treatment for water birds after an oil spill

Once a bird has been brought to a rehabilitation center, basic procedures are followed. The bird is sedated, if necessary. The bird is examined to detect broken bones, cuts or other injuries. Oil is flushed from its eyes and intestines. Heavily oiled birds are wiped with absorbent cloths to remove patches of oil. Stomach-coating medicines may be administered orally to prevent additional absorption of oil inside the bird's stomach. The bird is warmed. It is placed in a quiet area. Curtains are hung around the area to limit the bird's contact with people.

rewrite?

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Classification

- Class 1
- Class 2
- Class 3
- ...

Commonly used for results discussion

Classification

Such low UV responses follow from both intrinsic and more practical considerations. First, traditional cell designs incorporate highly doped window and/or emitter layers, which work as deadzones for UV light conversion because of the extremely short diffusion lengths for minority carriers in these regions. Second, anti-reflective coatings are typically optimized to minimize light reflections around the peak of the solar spectrum (500-700 nm), and can often have high reflection losses in the UV range. Finally, in most modules, solar cells are encapsulated with glass and/or plastic covers that absorb UV light.

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Definition

Photon upconversion (UC) process converts multiple low energy photons into a higher energy photon via so-called anti-Stokes emission, gathering enormous interests in many applications including biological imaging, solar energy harvesting, infrared sensing, displays and solid-state cooling. In particular, designed upconversion materials and structures with capabilities converting infrared (IR) photons within the 'biological transparency window' (around 800-1000 nm) to visible ones are of critical importance to deep-tissue light delivery for biomedical diagnosis and treatment.

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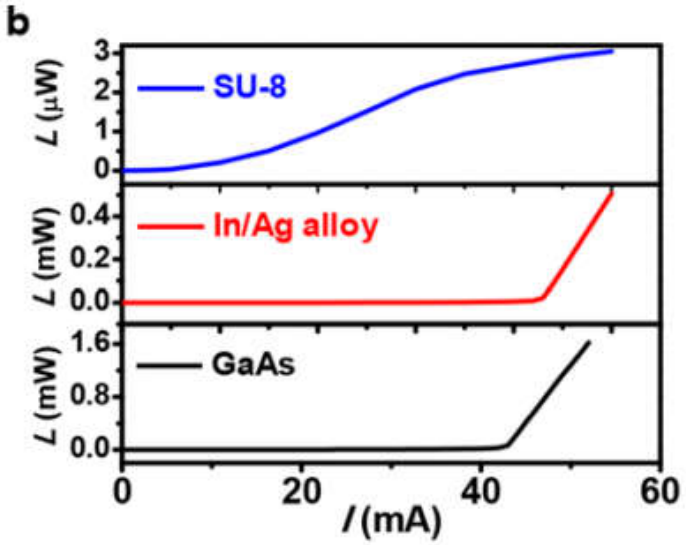
Comparison-Contrast

Figure 4b presents the measured output light power from the etched laser facets. At room temperature, the device printed on Si with the In/Ag interface exhibits a lasing threshold of ~ 43 mA, which is very similar to the an unreleased device on GaAs. As a comparison, the device printed on Si with a 0.5 mm thick organic based adhesive layer does not lase even at a very high injection current level (~ 100 mA) in CW mode and only emits spontaneous light in the W per facet range.



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