Transparent Luminescent Solar Concentrators

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Figure 1. Transparent Luminescent Solar Concentrator (TLSC). [1]

Luminescent Solar Concentrators

Three components:

1. Thin sheet
2. Luminescent species with different Stokes' shifts
3. Solar cells

Concentrate light radiation up to 10 times

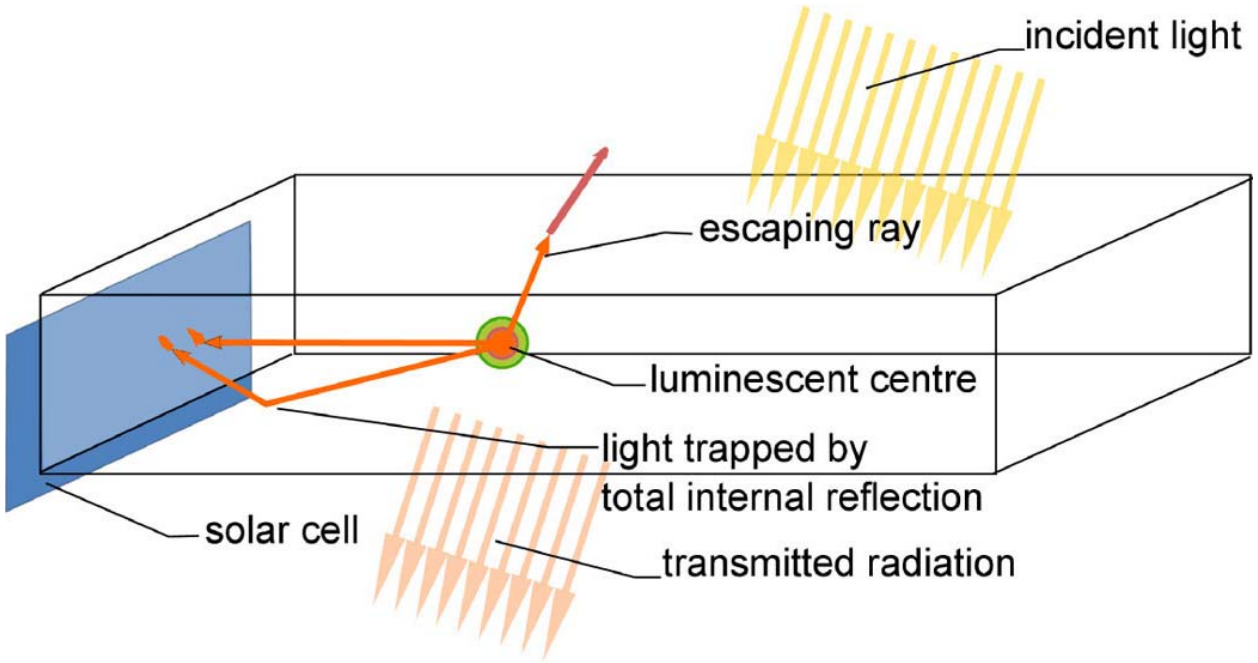

Figure 2. Luminescent Solar Concentrator (LSC). [2]

Considering LSC

Advantages	Disadvantages
• Low cost • Large area • Direct and diffuse solar radiation [3] • Energy harvesting efficiency [4] • Device autonomy	• Low power produced • Efficiency • Losses due to re-absorption of light • Colored tinted due to the visible spectrum

Transparent LSC

- Recent development
- Transparent in the visible spectrum
- Altered luminescent dyes to capture near-infrared (NIR), rather than UV
- Materials used with large Stokes' shift and with improved low Stokes' shift materials [4]

Schematic

Similar to luminescent solar concentrator

Visible light passed

NIR (and UV) light captured

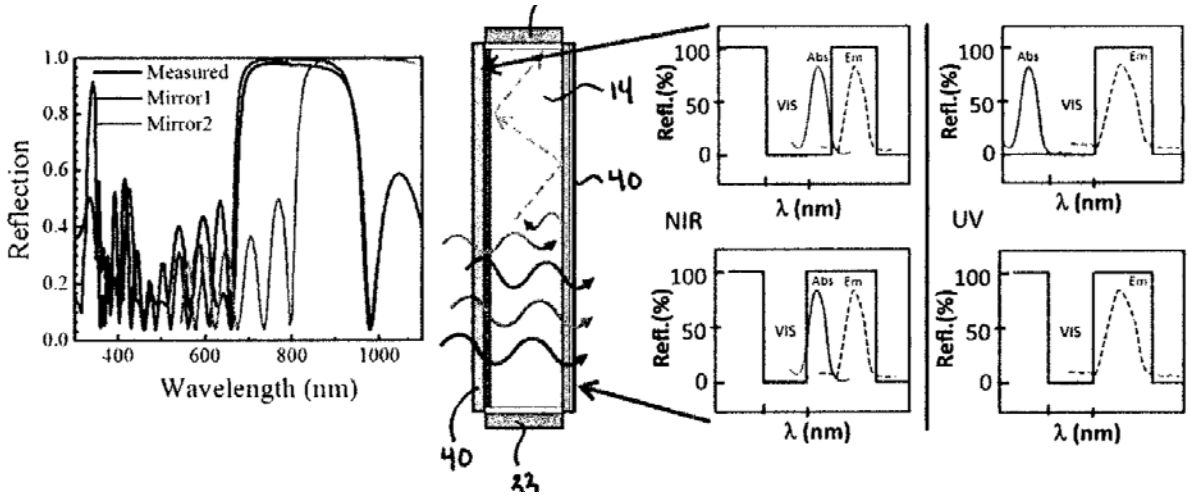

Figure 3. Captured spectrum. [3]

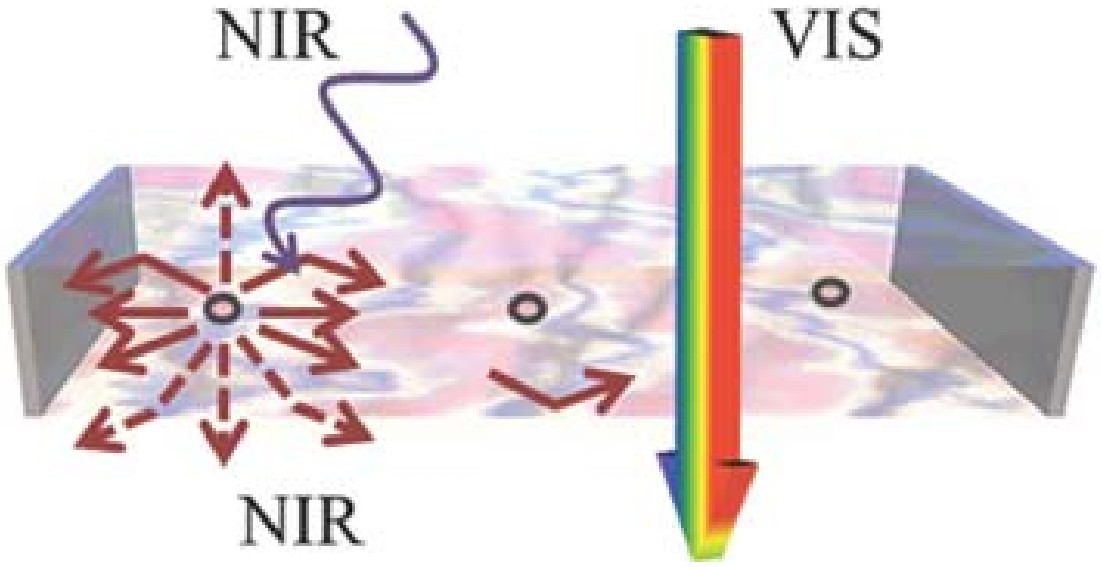

Figure 4. Schematic of TLSC. [4]

Considering TLSC

Advantages	Disadvantages
• More potential uses than LSC • Increased solar absorption • Flexibility and potential of expanding	• Efficiency: currently ~1%

References

[1] http://www.extremetech.com/extreme/188667-a-fully-transparent-solar-cell-that-could-make-every-window-and-screen-a-power-source

[2] http://spie.org/x110142.xml#B7

[3] http://siser.eps.hw.ac.uk/research/concentrating-pv/luminescent-solar-concentrators-lscs

[4] http://onlinelibrary.wiley.com/doi/10.1002/adom.201400103/full

[5] http://msutoday.msu.edu/news/2014/solar-energy-that-doesnt-block-the-view/

[6] http://appft1.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PG01&p=1&u=/netahtml/PTO/srchnum.html&r=1&f=G&l=50&s1=20140130864.PGNR.