PHILIPS

Luminescent
Solar Concentrator

Harvest the sunlight;
reap the opportunities

While the efficiency of solar cell panels is improving continually, current technologies still have their limitations. Luminescent Solar Concentrators (LSCs) offer a viable alternative, especially in large scale architectural applications. And transparent LSCs turn windows into smart glass that can generate power and darken automatically in sunlight.

Philips has made significant developments in LSC technologies. We have developed solutions for LSC challenges in collaboration with universities that are covered by 14 patents. Now we invite you to take the next step in turning these patents into commercial solutions. It's a significant challenge but one that has the potential for equally significant rewards.

The potential market is huge. LSCs can be used to create smart windows, or any exterior surface for building integrated photovoltaics (BIPV). Sunlight harvested by LSC panels is fed to solar cells located only around the edge of the sheet – one of several factors contributing to the low cost of LSC installations. Building infrastructures become power generators, supplying electricity that takes the pressure off the energy bill, and the grid.

LSC technology benefits

- Higher cost efficiency as result of better concentration ratio
- Converts any sunlight, even when cloudy
- Operates fully without needing to follow light source
  - efficiency unaffected by the direction of incidence of the light
  - no motor assemblies and associated maintenance costs

LSC IP benefits

- Critical LSC patents for:
  - existing techniques using dyes
  - applications involving two types of quantum dots
- Enables significant improvement of LSCs in:
  - overall efficiency
  - enhanced concentration ratio – gathers more light per area

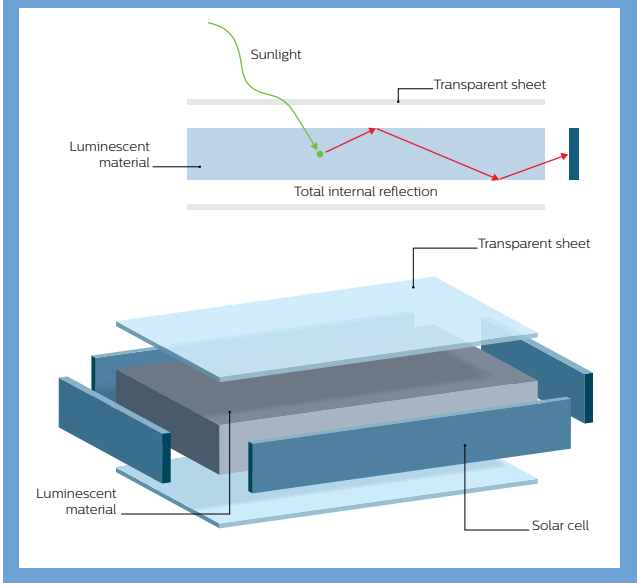
For companies such as materials manufacturers, wanting to explore new territory, LSCs present an innovative challenge with a promising prize. Capitalize on our research investments and venture into the sizeable industry of solar energy harvesting.

Patents

Here we present three exemplary patents, outlined in the table below. In addition, a further eleven patents describe improvements relating to LSCs and solar harvesting technologies in general. Together they form a large IP portfolio that is highly relevant for future applications. They focus primarily on techniques for getting the most out of innovative materials and the best methods for concentrating light in LSCs.

How a luminescent solar concentrator works

LSCs consist of large flat sheets of transparent material with luminescent material inside. They enable sunlight to be harvested over large areas, as the materials absorb incoming light and then re-emit it at a preferred wavelength. The emitted light is trapped within the luminescent sheet and guided to its edge where solar cells convert the trapped light into power.



EP 2377160-B1	EP 2504867-A2	EP 2593970-A1
· Describes the use of two types of quantum dots in LSCs	· Describes an LSC wherein the wavelength selective filter is engineered to maximize the concentration ratio.	· Relates to an exciting new type of converter material
· The mixture of quantum dots is engineered such that one type absorbs light, transfers the absorbed energy to the second type which emits light at a greater wavelength than that the first type absorbs.	· The wavelength selective filter has a refractive index contrast with a negative or zero dispersion and is designed to shift the reflection band of the incident radiation.	· The converter material for solar cells is a Sm^{2+} doped inorganic material
· This has been found to be advantageous as it enables the LSC to have a broad absorption range, but emits at a single wavelength with a narrow band width which increases the efficiency of a LSC.	· This leads to the advantage that the wavelength selective filter reflects a great amount of radiation being emitted by the luminescent substrate and decreases the amount of incident sunlight being reflected.	· Materials comprising Sm^{2+} can have a large Stokes shift which is useful for LSC applications · Additionally, line emission can be observed which prevents reabsorption and can increase the efficiency of a LSC.

LSC versus solar panel

LSCs work equally well in cloudy weather as in bright sunshine. Also, their performance remains constant even when they are not directly facing the sun, so they can be static without sacrificing efficiency. In comparison, solar panels need sunshine and preferably must move to face the sun directly, otherwise their efficiency drops significantly.

Questions?

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