

Phosphor based luminescent solar concentrators

This research is focussed on the development of a Phosphor based luminescent solar concentrator (LSC) device. In the field of photovoltaics, a LSC refers to a device that is used as a large area solar light collector, which then converts, emits the light and direct it to solar cells that is located at the small side area of the LSC by utilizing total internal reflection. As illustrated in Figure 1 the basic design of LSC is a luminescent material that is embedded into a transparent waveguide. A portion of the solar spectrum is absorbed by the luminescent material. This energy is then emitted at a different wavelength within the waveguide. Some of this light is trapped inside the waveguide due to internal reflection and is directed towards the edges of the waveguide as illustrated in Figure 2. Solar cells can be place on the sides which can generate electricity.

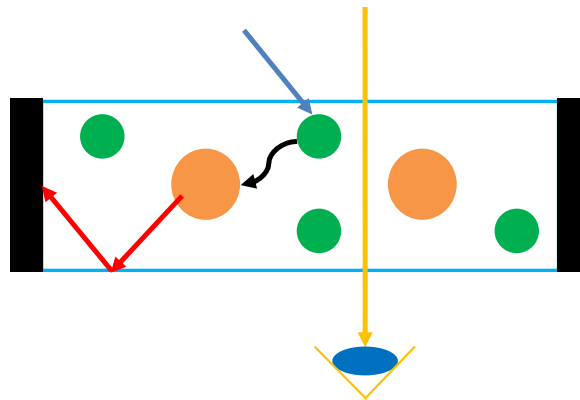


Figure 1 Schematic explaining the basic principle of a visibly transparent luminescent solar concentrator. Light from the visible region passes through the material without being absorbed, while light from the ultraviolet region is absorbed by the material. This energy is the transferred, downconverter and emitted in the infrared region. Some of this light is guided towards the edges of the material where solar cells are used for energy conversion.

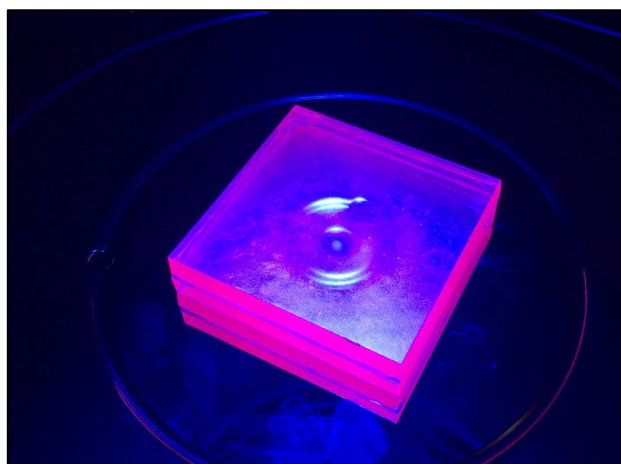


Figure 2 Photograph of a prototype device under a solar simulator. The incoming blue light is absorbed by the phosphor material, which converts it to red light which is internally reflected to the sides of the device.