

# The Usage of Transparent Luminescent Solar Concentrators to Reduce Carbon Dioxide Emissions

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For over the past few centuries, global energy reliance has depended heavily on fossil fuels such as coal, petroleum/oil, and natural gas. Fossil fuels are nonrenewable energy sources, and are being depleted rapidly due to high energy demands of modern society. However, the most significant problem that use of fossil fuels presents is its contribution to climate change. Not only do fossil fuels lead to the hazards of coal mining, oil spills, and acid rain, they also result in dangerous numbers of air pollution. The burning of fossil fuels releases various greenhouse gases including carbon dioxide, causing radical changes in the Earth's climate and posing threats to countless species.

Nearly 30 percent of the greenhouse gas emissions result from energy use across the globe, and the United States is one of the top three nations in the world in terms carbon dioxide emissions. As the largest single source of greenhouse gas emissions, energy supply and sources need to be re-evaluated and assessed. Recently, there has been a push for the usage of renewable energy in order to decrease the dependencies on fossil fuels, specifically solar power. Solar power is one of the most easily accessible and common sources of newer energy sources. They have numerous uses, ranging from water heaters to electricity generators. Solar cells and panels require little maintenance and do not create excess noise or trouble, with little obstruction introduced overall. This energy source is now applicable to recreational uses as well.

As technology and mobile devices have evolved and took a large presence in everyday life, the demand for energy to power our portable devices has grown exponentially. According to the Pew Research Center's findings as of April, nearly two-thirds of all Americans own a smartphone, with 46 percent of users stating that "they could not live without" the devices.

One current use of solar energy for recreational use includes portable solar cells that have USB ports and can be utilized to charge devices such as smartphones, e-books, music players, and tablets. These are typically made of monocrystalline silicon panels, and are typically rigid in nature. Some are flexible - those composed of thin film PV technology. However, these are excessive weight at times and often prove to be inconvenient in terms of aesthetics and portability.

Aside from common solar panels and portable cells, researchers have been developing a thin transparent luminescent solar concentrator which can capture infrared and ultraviolet energy yet let visible light pass through the concentrator. This is a large advance in the field and a huge potential for the future - to help conserve our planet. These thin and fully transparent solar

concentrators can be placed over the displays on portable devices and mobile phones, reducing the necessity of plugging in and recharging while at the same time allowing clean energy to be harvested and used. They would also diminish the use of fossil fuels, as less electricity will be used to charge these devices through wall outlets.

The transparent luminescent solar concentrator (TLSC) would not actually be a traditional solar cell that captures light from the sun. Instead, the layer would be constructed from material that allows visible light to travel through but absorbs specific wavelengths of ultraviolet and infrared light instead. This is made possible through the use of organic salt components inside the layer, which The transparent layer then emits infrared light in another non-visible wavelength. On the edge of the transparent layer there are thin strips of photovoltaic solar cell which turns the light into usable electric charge.

While the amount of energy replenished daily on a single phone may be minute compared to larger efforts, the combined efforts of even a small fraction of mobile devices present today can make a large, lasting impact on reducing fossil fuels.

Compared to the bulky portable solar chargers in which you have to bring with you every time you want to charge your mobile device, this thin TLSC will be integrated into your device. This means that as long as there is UV or infrared energy present, the TLSC will be constantly recharging the device. Another benefit is that the chances of the recharging device getting lost or stolen reduces to zero as it will be firmly attached and brought along wherever your phone will be. While some may argue that the layer of TLSC may be obstructive and prevent normal usage of the device, their argument is false as these solar concentrators are less than 0.5mm thin to allow normal touch screen usage without loss of sensitivity, while allowing all of the visible light to pass through enabling the user to view the contents displayed clearly without obstruction.

Not only are these solar concentrators portable and non-obstructive, but they can under dire circumstances tell the difference between life and death. Imagine a person got into a serious accident with nobody around him/her for help. It also just so happens that his/her phone battery died earlier that day. Having this TLSC attachment on their phone can give him/her the crucial electricity needed on the spot to make an emergency phone call.

In fact, every screen or window can become a solar cell using this technology and harvest energy for recreational and even industrial use in the future. In a city filled with skyscrapers, the total amount of energy that could be harvested from all the window panes would be able to reduce the amount of fossil fuels burned. Although the technology is still under development and is currently optimal for market, researchers are beginning to conclude that these transparent cells' efficiency can reach 10 percent in harvesting energy.

Overall, the transparent luminescent solar concentrator is one of the most promising methods of solar energy harvesting through recreational use. The usage of mobile devices, now a dominant trend in society, would help us collect renewable energy and allow for the decrease in the burning of fossil fuels. Through research and further developments, the transparents concentrator can fill the building exteriors of cities across the globe, and provide significant amounts of clean energy.