



Window Integrated Solar Collector

Modern architecture calls for expansive glass walls, especially in public and office buildings. Large windows increase daylight illumination, but also allow more of the solar infrared radiation to enter the building, leading to excess heat collection. Air conditioning then has to be used to keep the temperature comfortable. This wastes energy. Indeed, approximately half of the energy consumption within Europe consists of heating and cooling.

Existing solutions to the problem such as automatically darkening windows also block visible light. Further, in every existing solution the energy of the blocked radiation will be reflected back and lost.

The main goal of the project is to develop a fully transparent window which collects infrared light and converts it into usable energy. As IR radiation would no longer penetrate the window, air conditioning becomes unnecessary. Taking into account the energy produced by the window, the total efficiency of the window could in theory be as high as 200%.

Our window concept is based on covering the windows with metal nanoparticles. Incident solar IR light is efficiently scattered by them due to a so-called local surface plasmon resonance. The scattered light is trapped within the window by total internal reflection and propagates to the edge of the window, where the infrared energy is collected, for example by solar cells or a circulating fluid. The window thus acts as a solar concentrator. Visible wavelengths do not excite the plasmon resonances and therefore pass through the window.

Preventing global warming requires reducing the total energy consumption, as well as finding more efficient renewable energy sources. Due to this the biggest growth in the global energy market has been within the solar energy sector.

If our windows could be made available at an affordable price, as is our aim, they would revolutionize global green energy production. They would vastly increase the amount of solar energy produced without requiring covering buildings with solar panels.

Researchers working in the team

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