

Sun protection without blinds

May 8 2018, by Cornelia Zogg

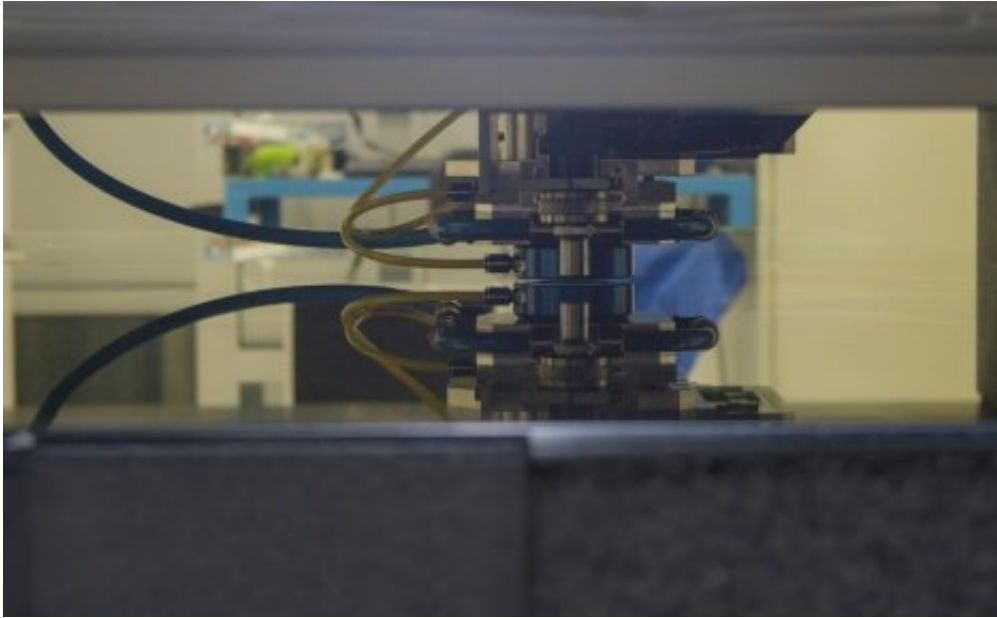


Window glass that transmits light optimally but keeps the heat outside: a dream of many architects. Credit: Floriane Vita, Unsplash

Summer. Blue sky. Sunshine. But you don't notice much of it in the office or in your home, because the blinds block the view so that the heat stays outside. This scenario could soon be a thing of the past: EPFL researchers are working with Empa on a window glass that keeps out the heat in summer and at the same time allows a clear view of the outside world.

Depending on the season, windows must have a different function in order to provide sufficient comfort in offices and apartments. In summer they should keep heat away and prevent glare from the sun. In winter they should distribute the little light optimally in the room. A team led by Andreas Schüler from the Laboratory for Solar Energy and Building Physics at EPFL has recently developed a [window](#) that meets all these criteria. In cooperation with Empa researchers led by Patrik Hoffmann from the Laboratory for Advanced Materials Processing in Thun, work is currently underway on their manufacture—which could soon make sun blinds redundant. Seasonal window glass reduces summer overheating and glare in buildings and ensures high [solar energy](#) and daylight input in winter. All this without impairing the view outwards through dimming or blinds.

Jing Gong, a Ph.D. student at EPFL, used Empa's highly complex laser system in Thun to produce a so-called master form with a microstructured surface with the precision laser. Micro mirrors are then evaporated into these micro-grooves and encapsulated in a polymer film. This film can then be easily inserted into a conventional double-glazed window. The arrangement of so-called "Compound Parabolic Concentrator" (CPC) lenses is used to optimally reflect sunlight with low restrictions in visibility. While the first prototypes have been developed in the laboratory, the researchers are already working on up-scaling. In a pilot project in cooperation with BASF Switzerland, the team is working on a manufacturing process that should make it possible to produce the window glass coating consisting of millions of micro mirrors with high precision, quickly and cost-effectively. This poses a major challenge due to the very high optical quality requirements. The next step is to show whether the glass passes the everyday test. The windows will be installed in the NEST building on the Empa campus in Dübendorf in the Solace unit of EPFL.



The first prototypes of the high-tech window glass are produced on the laser system at Empa in Thun. Credit: Swiss Federal Laboratories for Materials Science and Technology

The innovative window glass offers numerous advantages, as the researchers confirm in an initial estimate. "The [glass](#) can reduce the consumption of thermal energy from heating or air conditioning by 10 to 20 percent," says Hoffmann. In many cases, window blinds could be dispensed with in future. Light should also be distributed more evenly throughout the room. In their research work, the researchers were able to demonstrate that the idea works. Daylight autonomy is considerably increased. With a light incidence of 60 degrees, the prototypes already divert 80% of the light—in an almost horizontal direction. This means that even the furthest corners of an office or apartment are better illuminated, which can have a positive influence on the living climate, especially in winter—in darker lighting conditions. The window also remains transparent, the view is not changed.

Provided by Swiss Federal Laboratories for Materials Science and Technology

Citation: Sun protection without blinds (2018, May 8) retrieved 28 April 2024 from <https://phys.org/news/2018-05-sun.html>

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