[Researchers introduce first flat optical lens that may revolutionize Virtual Reality]

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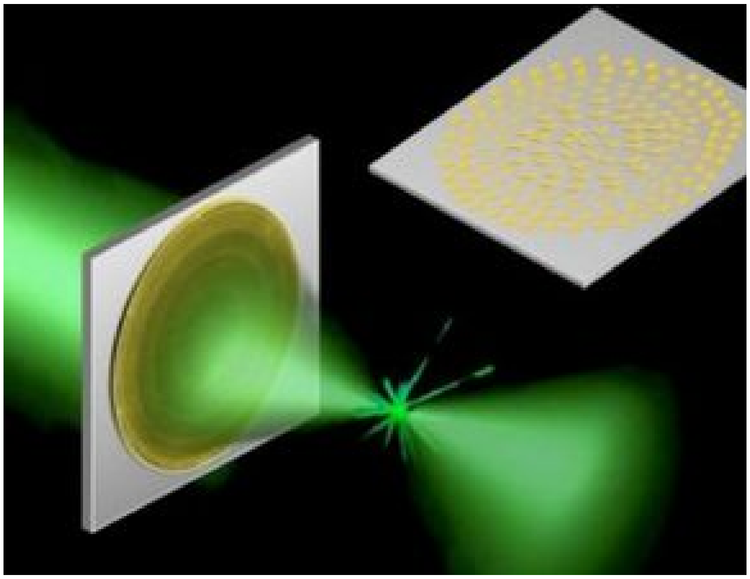

Optical lenses we have so far are not compact or thin, so researchers from the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) have presented first planar lens that works with high efficiency within the visible spectrum of light, capable of covering all colors.

The planar that researchers have come up with is a lens that can resolve nanoscale features separated by distances smaller than the wavelength of light. The lens uses an ultrathin array of tiny waveguides, known as a metasurface, which bends light as it passes through, as it happens in a curved lens. The research is described by the researchers in the journal Science.

Soon in future, we will witness large scale production of metalenses at a cost significantly less to what takes to make conventional lenses. The mass production of microprocessors and memory chips would be done using foundries. The lens is made of titanium dioxide nanofins on a glass substrate. The meta-lens focuses an incident light to a spot smaller than the incident wavelength.

> "This technology is potentially revolutionary because it works in the visible spectrum, which means it has the capacity to replace lenses in all kinds of devices, from microscopes to camera, to displays and cell phones", said Federico Capasso, Robert L. Wallace Professor of Applied Physics and Vinton Hayes Senior Research Fellow in Electrical Engineering and senior author of the paper.

According to Rob Devlin, a graduate student in the Capasso lab and co-author of the paper, the researchers needed a material that would not absorb or scatter light for focusing red, blue and green light that are in the visible spectrum.

According to a story published on the topic by BBC, "Just 2mm across and finer than a human hair, the tiny device can magnify nanoscale objects and gives a sharper focus than top-end microscope lenses. It is the latest example of the power of metamaterials, whose novel properties emerge from their structure."

Shapes on the surface of this lens are smaller than the wavelength of light involved: a thousandth of a millimetre. "In my opinion, this technology will be game-changing," said Federico Capasso of Harvard University, the senior author of a report on the new lens which appears in the journal Science.

Those comparisons were made against top-end lenses used in research microscopes, designed to achieve absolute maximum magnification. The focal spot of the flat lens was typically 30% sharper than its competition, meaning that in a lab setting, finer details can be revealed.

"Materials science has made a great leap forward toward replacing glass lenses with metasurface materials that are practical to manufacture and produce aberration-free, subwavelength-resolution images. The planar metalens could replace traditional optics in smartphones, digital cameras and microscopes to enable further miniaturization of those devices," according to a news report published by Photonics.

The work was performed in the lab of physics and applied engineering professor Federico Capasso of Harvard University, whose contributions to the field of photonics, in addition to metasurface research and development, include the quantum cascade laser. Capasso discussed the technology with Photonics Media ahead of the study's release.

The metasurface lens features towers of titanium dioxide — about 600 nm in length — which focus light based on their patterning, enabling a uniform-thickness component. In the metasurface lens, the towers bend light toward the focal point; the researchers reported the metalens achieved the same resolution and magnification as a traditional glass lens 5 to 6 cm in length.

A report published in Phys said, "Researchers from the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) have demonstrated the first planar lens that works with high efficiency within the visible spectrum of light—covering the whole range of colors from red to blue. The lens can resolve nanoscale features separated by distances smaller than the wavelength of light. It uses an ultrathin array of tiny waveguides, known as a metasurface, which bends light as it passes through, similar to a curved lens."

"This technology is potentially revolutionary because it works in the visible spectrum, which means it has the capacity to replace lenses in all kinds of devices, from microscopes to camera, to displays and cell phones," said Federico Capasso, Robert L. Wallace Professor of Applied Physics and Vinton Hayes Senior Research Fellow in Electrical Engineering and senior author of the paper. "In the near future, metalenses will be manufactured on a large scale at a small fraction of the cost of conventional lenses, using the foundries that mass produce microprocessors and memory chips."

"Correcting for chromatic spread over the visible spectrum in an efficient way, with a single flat optical element, was until now out of reach," said Bernard Kress, Partner Optical Architect at Microsoft, who was not part of the research. "The Capasso group's metalens developments enable the integration of broadband imaging systems in a very compact form, allowing for next generations of optical sub-systems addressing effectively stringent weight, size, power and cost issues, such as the ones required for high performance AR/VR wearable displays."

Virtual Reality Designs Group, who have been delivering various types of flat lens VR glasses since 1990, say that the future of VR is about to get “Amazing”.