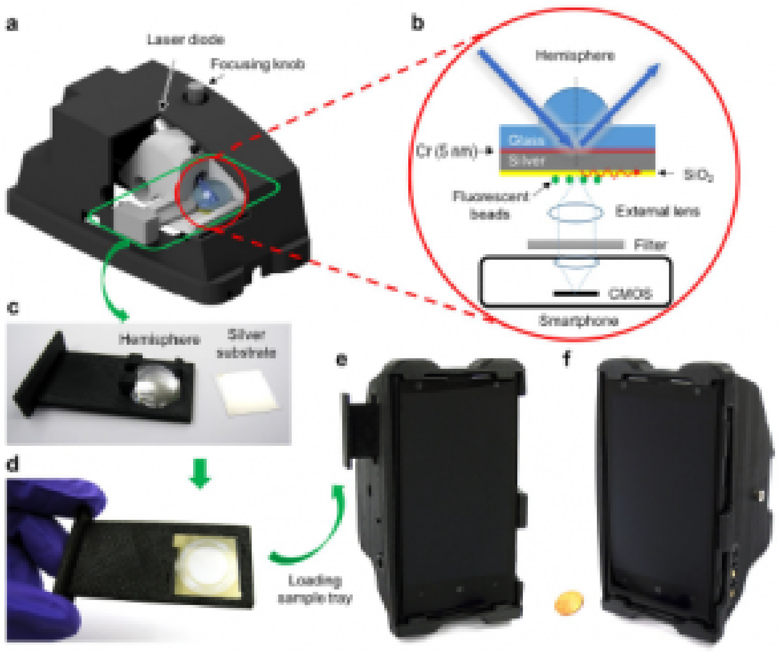
[Plasmonics enhances the sensitivity of smartphone microscopy]

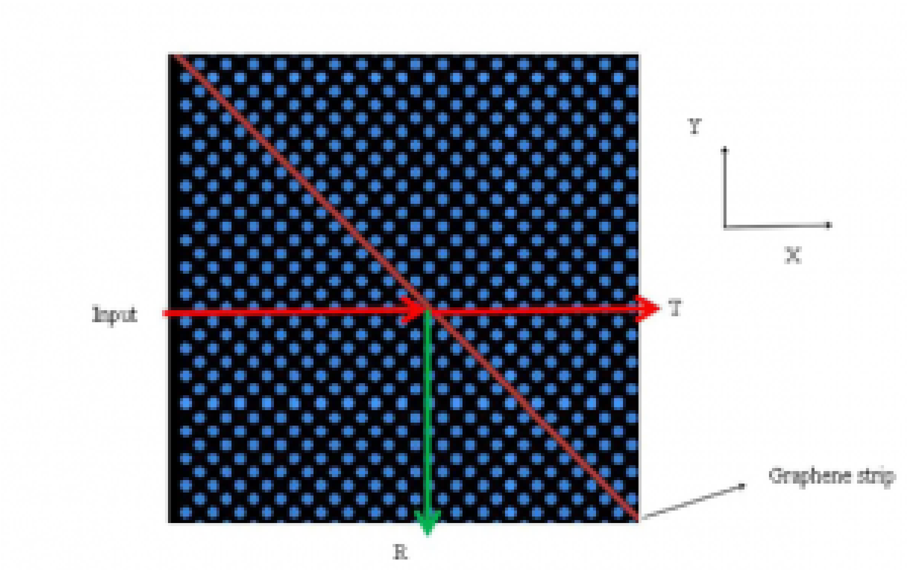


Smartphone fluorescence microscopy has various applications in point-of-care (POC) testing and diagnostics, ranging from e.g., quantification of immunoassays, detection of microorganisms, to sensing of viruses. An important need in smartphone-based microscopy and sensing techniques is to improve the detection sensitivity to enable quantification of extremely low concentrations of target molecules. Here, they demonstrate a general strategy to enhance the detection sensitivity of a smartphone-based fluorescence microscope by using surface-enhanced fluorescence (SEF) created by a thin metal-film. In this plasmonic design, the samples are placed on a silver-coated glass slide with a thin spacer, and excited by a laser-diode from the backside through a glass hemisphere, generating surface plasmon polaritons. They optimized this mobile SEF system by tuning the metal-film thickness, spacer distance, excitation angle and polarization, and achieved ~10-fold enhancement in fluorescence intensity compared to a bare glass substrate, which enabled us to image single fluorescent particles as small as 50 nm in diameter and single quantum-dots. Furthermore, They quantified the detection limit of this platform by using DNA origami-based brightness standards, demonstrating that ~80 fluorophores per diffraction-limited spot can be readily detected by our mobile microscope, which opens up new opportunities for POC diagnostics and sensing applications in resource-limited-settings.

Sources:https://phys.org/news/2017-05-plasmonics-sensitivity-smartphone-microscopy.html?utm_source=menu&utm_medium=link&utm_campaign=item-menu

Related paper: Qingshan Wei1 et al., Plasmonics Enhanced Smartphone Fluorescence Microscope, *Scientific Reports* 7, Article number: 2124 (2017).

A tunable high-efficiency optical switch based on graphene coupled photonic crystals structure

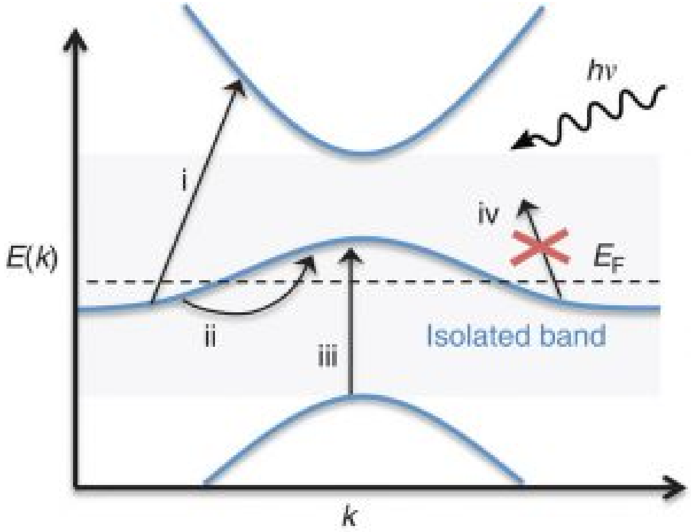


A plasmonic device for high-efficiency optical switch is proposed based on graphene coupled photonic crystals structure. The finite-difference time-domain simulation results show that the transmission and reflection ratio can be controlled by tuning the parameters of the graphene strip, such as chemical potential or width. And the corresponding contrast ratio can be 25 and 26.8 for a single and double graphene strips coupled photonic crystals structure, respectively. The results in this paper will have potential application in nanosensors and integrated photonic circuits.

Sources:http://dx.doi.org/10.1080/09500340.2017.1298859

Related paper: Fang Chen, BA tunable high-efficiency optical switch based on
graphene coupled photonic crystals structure, Journal of Modern Optics,Pages 1-7, (2017).

Band structure engineered layered metals for low-loss plasmonics



Plasmonics currently faces the problem of seemingly inevitable optical losses occurring in the metallic components that challenges the implementation of essentially any application. In this work, they show that Ohmic losses are reduced in certain layered metals, such as the transition metal dichalcogenide TaS2, due to an extraordinarily small density of states for scattering in the near-IR originating from their special electronic band structure. On the basis of this observation, they propose a new class of band structure engineered van der Waals layered metals composed of hexagonal transition metal chalcogenide-halide layers with greatly suppressed intrinsic losses. Using first-principles calculations, they show that the suppression of optical losses lead to improved performance for thin-film waveguiding and transformation optics.

Sources: https://www.nature.com/articles/ncomms15133
Related paper: Morten N. Gjerding et al., Band structure

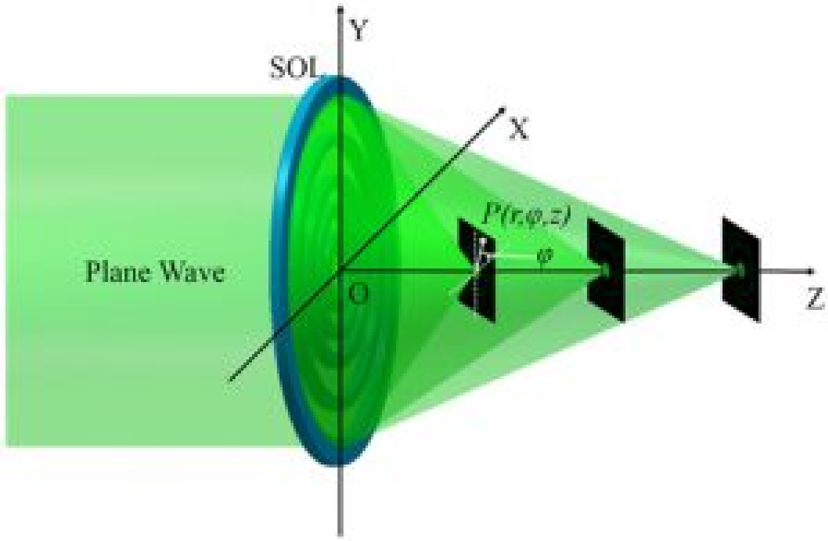
engineered layered metals for low-loss plasmonics, *Nature Communications* **8**, Article number: 15133 (2017).

Congratulations on the acceptance of the paper "Optical detection of brain activity using plasmonic ellipsometry technique"

The paper entitled **"Optical detection of brain activity using plasmonic ellipsometry technique"** is written by Foozieh Sohrabi under the direct supervision of Dr Seyedeh Mehri Hamidi and it is accepted in the **journal of Sensors and Actuators B: Chemical**. In this paper, a new method of optical detection of brain activity has been proposed.

The journal link will be available in near future.

[Controllable design of super-oscillatory lenses with multiple sub-diffraction-limit foci]



The conventional multifocal optical elements cannot precisely control the focal number, spot size, as well as the energy distribution in between. Here, the binary amplitude-type super-oscillatory lens (SOL) is utilized, and a robust and universal optimization method based on the vectorial angular spectrum (VAS) theory and the genetic algorithm (GA) is proposed, aiming to achieve the required focusing performance with arbitrary number of foci in preset energy distribution. Several typical designs of multifocal SOLs are demonstrated.

Verified by the finite-difference time-domain (FDTD) numerical simulation, the designed multifocal SOLs agree well with the specific requirements. Moreover, the full-width at half-maximum (FWHM) of the achieved focal spots is close to $\lambda/3$ for all the cases (λ being the operating wavelength), which successfully breaks the diffraction limit. In addition, the designed SOLs are partially insensitive to the incident polarization state, functioning very well for both the linear polarization and circular polarization. The optimization method presented provides a useful design strategy for realizing a multiple sub-diffraction-limit foci field of SOLs. This research can find its potentials in such fields as parallel particle trapping and high-resolution microscopy imaging.

Source: https://www.nature.com/articles/s41598-017-01492-y

Related paper: Muyuan et al., Controllable design of super-oscillatory lenses with multiple sub-diffraction-limit foci, *Scientific Reports* **7**, Article number: 1335 (2017).