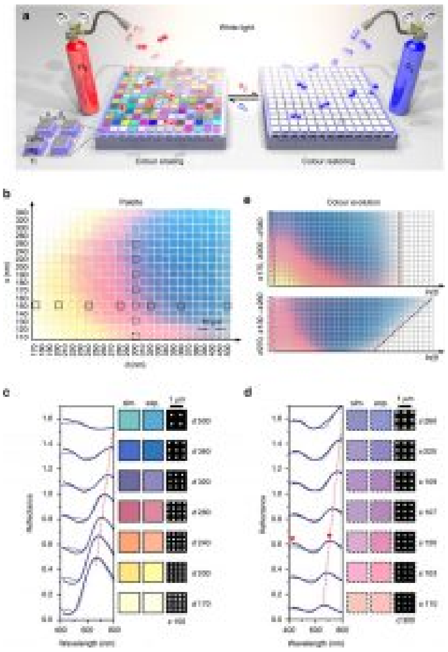
Dynamic plasmonic colour display

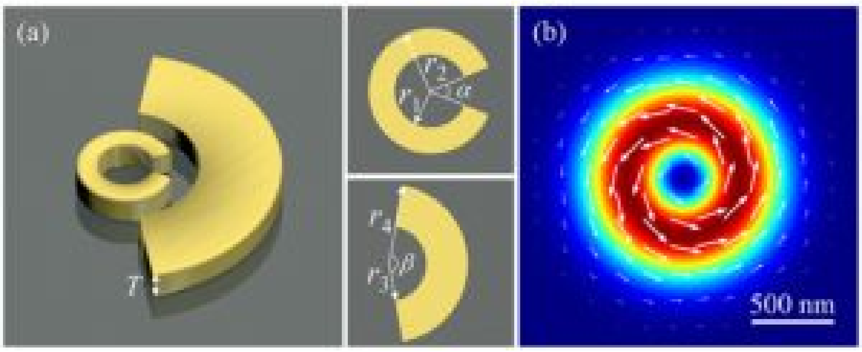


Plasmonic colour printing based on engineered metasurfaces has revolutionized colour display science due to its unprecedented subwavelength resolution and high-density optical data storage. However, advanced plasmonic displays with novel functionalities including dynamic multicolour printing, animations, and highly secure encryption have remained in their infancy. Here they demonstrate a dynamic plasmonic colour display technique that enables all the aforementioned functionalities using catalytic magnesium metasurfaces. Controlled hydrogenation and dehydrogenation of the constituent magnesium nanoparticles, which serve as dynamic pixels, allow for plasmonic colour printing, tuning, erasing and restoration of colour. Different dynamic pixels feature distinct colour transformation kinetics, enabling plasmonic animations. Through smart material processing, information encoded on selected pixels, which are indiscernible to both optical and scanning electron microscopies, can only be read out using hydrogen as a decoding key, suggesting a new generation of information encryption and anti-counterfeiting applications.

Source: https://www.nature.com/articles/ncomms14606

Related paper: Xiaoyang Duan et al., Dynamic plasmonic colour display, *Nature Communications* **8**, Article number: 14606 (2017).

[Fano resonance with high local field enhancement under azimuthally polarized excitation]()



Being an enabling technology for applications such as ultrasensitive biosensing and surface enhanced spectroscopy, enormous research interests have been focused on further boosting the local field enhancement at Fano resonance. Here, they demonstrate a plasmonic Fano resonance resulting from the interference between a narrow magnetic dipole mode and a broad electric dipole mode in a split-ring resonator (SRR) coupled to a nanoarc structure. Strikingly, when subjected to an azimuthally polarized beam (APB) excitation, the intensity enhancement becomes more than 60 times larger than that for a linearly polarized beam (LPB). We attribute this intensity enhancement to the improved conversion efficiency between the excitation and magnetic dipole mode along with improved near-field coupling. The APB excited Fano structure is further used as a nanoruler and beam misalignment sensor, due to the high sensitivity of intensity enhancement and scattering spectra to structure irregularities and excitation beam misalignment. Interestingly, they find that, regardless of the presence of structural translations, the proposed structure still maintains over 60 times better intensity enhancement under APB excitation compared to LPB excitation. Moreover, even if the APB excitation is somewhat misaligned, their Fano structure still manages to give a larger intensity enhancement than its counterpart excited by LPB.

Source: **https://www.nature.com/articles/s41598-017-00785-6**

Related paper: Wuyun Shang et al.,Fano resonance with high local field enhancement under azimuthally polarized excitation, *Scientific Reports* **7**, Article number: 1049 (2017).