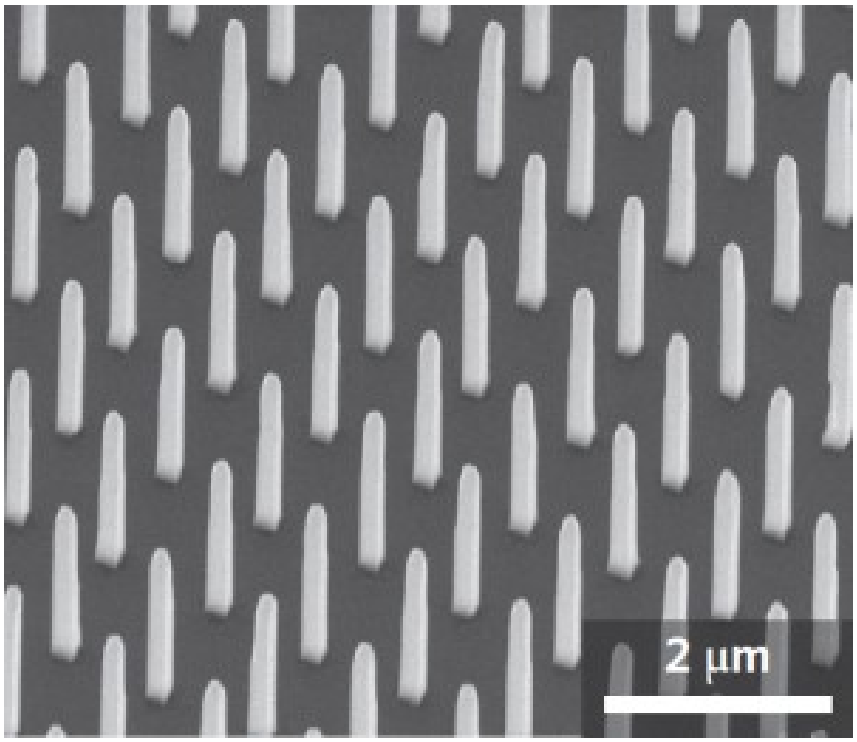
Ultrafast switching of tunable infrared plasmons in indium tin oxide nanorod arrays with large absolute amplitude



All-optical control of plasmons can enable optical switches with high speeds, small footprints and high on/off ratios. Here Guo et al., demonstrate ultrafast plasmon modulation in the near-infrared (NIR) to mid-infrared (MIR) range by intraband pumping of indium tin oxide nanorod arrays (ITO-NRAs). They observe redshifts of localized surface plasmon resonances arising from a change of the plasma frequency of ITO, which is governed by the conduction band non-parabolicity. They generalize the plasma frequency for non-parabolic bands, quantitatively model the fluence-dependent

plasma frequency shifts, and show that different from noble metals, the lower electron density in ITO enables a remarkable change of electron distributions, yielding a significant plasma frequency modulation and concomitant large transient bleaches and induced absorptions, which can be tuned spectrally by tailoring the ITO-NRA geometry. The low electron heat capacity explains the sub-picosecond kinetics that is much faster than noble metals. Their work demonstrates a new scheme to control infrared plasmons for optical switching, telecommunications and sensing.

The news was sent to the administrator by Nasrin Asgari.

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