Abstract Submitted
for the TSF17 Meeting of
The American Physical Society

Tunable conducting oxide metasurface color filter[1] JINQIANNAN ZHANG, LONG TAO, ALEKSEI ANOPCHENKO, HO WAI HOWARD LEE[2], Department of Physics, Baylor University, Waco, TX 76798, United States — Opto-electronic transducing mechanism provides an unprecedented opportunity to achieve post-fabrication control in metasurface devices. However, there are only few works on electrically controlled metasurface color filters. In this work, we propose a novel color filter structure in which the light transmission can be electrically controlled. The proposed structure is a modified periodic metal-insulator-metal (MIM) configuration with ultrathin layers of indium tin oxide (ITO) and hafnium dioxide (HfO_2) sandwiched between two gold nanostrips. When electrically biased the ITO layer changes its optical property due to the electron accumulation at the ITO-HfO_2 interface and hence changes dispersion property of the structure. The numerical simulation shows that a high electrical modulation ratio of 20.5 dB of transmission can be achieved around the frequency region where ITO's permittivity is close to zero, known as the epsilon-near-zero (ENZ) point. Moreover, the structure exhibits the maximum resonance shift of 40 nm under the electrical bias of 5 V. The electrical modulated nanoscale color filter can be used in imaging devices and bring new functionalities to cameras or biosensing.

[1]This work was supported in parts by The Defense Advanced Research Projects Agency (grant number N66001-17-1-4047), the Young Investigator Development Program, and the Vice Provost for Research at Baylor University.
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Date submitted: 03 Oct 2018 Electronic form version 1.4