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Ultrafast Imaging of Chiral Surface Plasmon by Photoemission Electron Microscopy YANAN DAI, MACIEJ DABROWSKI, HRVOJE PETEK, University of Pittsburgh — We employ Time-Resolved Photoemission Electron Microscopy (TR-PEEM) to study surface plasmon polariton (SPP) wave packet dynamics launched by tunable (VIS-UV) femtosecond pulses of various linear and circular polarizations. The plasmonic structures are micron size single-crystalline Ag islands grown in situ on Si surfaces and characterized by Low Energy Electron Microscopy (LEEM). The local fields of plasmonic modes enhance two and three photon photoemission (2PP and 3PP) at the regions of strong field enhancement. Imaging of the photoemission signal with PEEM electron optics thus images the plasmonic fields excited in the samples. The observed PEEM images with left and right circularly polarized light show chiral images, which is a consequence of the transverse spin momentum of surface plasmon. By changing incident light polarization, the plasmon interference pattern shifts with light ellipticity indicating a polarization dependent excitation phase of SPP. In addition, interferometric-time resolved measurements record the asymmetric SPP wave packet motion in order to characterize the dynamical properties of chiral SPP wave packets.

Yanan Dai
University of Pittsburgh

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