Defect-induced Non-linear Optical Properties in BN
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PODILA, APPARAO RAO, Clemson Univ — Emerging two-dimensional materials
are known for their excellent optical properties. Unlike most 2D materials which
display saturable absorption, boron nitride (BN) is an exception in that it exhibits
multi-photon absorption. Although a two-photon absorption process was proposed
to explain intrinsic non-linear absorption in BN, we find higher order nonlinearities
such as five-photon absorption at 1064 nm. Interestingly, as will be discussed in this
talk, our density functional theory calculations, finite-element analysis simulation,
and experimental studies present compelling evidence that defect-induced mid-gap
states in BN reduce higher order nonlinearities to enable two-photon absorption.
Lastly, strong nonlinear light-matter interactions in BN are found to induce de-
tections, which convert five-photon absorption to two-photon in situ.