Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Development of graphene oxide materials with controllably modified optical properties ANTON NAUMOV, Central Connecticut State University, CHARUDATTA GALANDE, Rice University, ADITYA MOHITE, Los Alamos National Laboratory, PULICKEL AJAYAN, R. BRUCE WEISMAN, Rice University
— One of the major current goals in graphene research is modifying its optical and electronic properties through controllable generation of band gaps. To achieve this, we have studied the changes in optical properties of reduced graphene oxide (RGO) in water suspension upon the exposure to ozone. Ozonation for the periods of 5 to 35 minutes has caused a dramatic bleaching of its absorption and the concurrent appearance of strong visible fluorescence in previously nonemissive samples. These observed spectral changes suggest a functionalization-induced band gap opening. The sample fluorescence induced by ozonation was found to be highly pH-dependent: sharp and structured emission features resembling the spectra of molecular fluorophores were present at basic pH values, but this emission reversibly broadened and red-shifted in acidic conditions. These findings are consistent with excited state protonation of the emitting species in acidic media. Oxygen-containing addends resulting from the ozonation were detected by XPS and FTIR spectroscopy and related to optical transitions in localized graphene oxide fluorophores by computational modeling. Further research will be directed toward producing graphene-based optoelectronic devices with tailored and controllable optical properties.

Anton Naumov
Central Connecticut State University

Date submitted: 11 Nov 2014 Electronic form version 1.4