Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

**Evidence for edge state photoluminescence in graphene quantum dots** KIRAN LINGAM, RAMAKRISHNA PODILA, Department of Physics and Astronomy, Clemson University, Clemson, SC 29634, HAIJUN QIAN, Electron Microscope facility, Clemson research park, Clemson University, Anderson, SC USA 29625., STEVE SERKIZ, Savannah River National Laboratory, Aiken, SC USA 29808, APPARAO M. RAO, Department of Physics and Astronomy, Clemson University, Clemson, SC 29634 — For a practical realization of graphene-based logic devices, opening of a band gap in graphene is crucial and has proved challenging. To this end, several synthesis techniques including unzipping of carbon nanotubes, chemical vapor deposition and other bottom-up fabrication techniques have been pursued for the bulk production of graphene nanoribbons (GNRs) and graphene quantum dots (GQDs). However, only a limited progress has been made towards a fundamental understanding of the electronic and optical properties of GQDs. In particular, the origin of strong photoluminescence (PL) in GQDs, which has been attributed to the presence of emissive surface traps and/or the edge states in GQD, remains inconclusive to date. Here, we experimentally show that the PL is independent of the functional groups attached to the GQDs. Following a series of annealing experiments, we further show that the PL in GQDs originates from the edge states, and an edge-passivation subsequent to synthesis quenches PL. These results are consistent with comparative studies on other carbon nanostructures such as GNRs and carbon nano-onions.

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Date submitted: 28 Nov 2012 Electronic form version 1.4