Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Diamond Based Electron Emitters for Photon Enhanced Thermionic Energy Conversion[1] TIANYIN SUN, FRANZ A. KOECK, ROBERT J. NEMANICH, Arizona State University — Energy conversion cells utilize either direct photon illumination or indirect thermal energy for electron excitation. Nitrogen-doped, hydrogen terminated nanocrystalline diamond films display a negative electron affinity and have shown low temperature thermionic emission which can be employed for energy conversion in a vacuum thermionic emission cell. However, the low work function of such films suggests that the current could be enhanced through visible light illumination to induce photoelectron emission. We present measurements of the spectrum of emitted electrons from N-doped diamond films for light illumination between 600 and 340nm, while the film is heated from ambient to 500C. Features due to thermionic and photo-emission are identified, and a complex interaction is observed between the two processes at various temperatures and illumination wavelengths. The results indicate the potential application of diamond emitters as combined thermal and photon energy converters, and we present a new approach to enhance the performance of diamond-film energy converters.

[1]This research is supported through the Office of Naval Research.

Robert J. Nemanich
Arizona State University

Date submitted: 09 Dec 2010 Electronic form version 1.4