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**Combined Photo and Thermionic Energy Conversion with Doped Diamond Electron Emitters** TIANYIN SUN, FRANZ KOECK, ROBERT NEMANICH, Arizona State University — Conversion of heat into electrical energy has been demonstrated using low effective work function diamond films achieved with n-type doping and surface hydrogen termination. Recently, visible light photo-electron emission has been demonstrated from the same diamond, and this work suggests that this effect could be utilized for a new approach to solar energy conversion namely combined photo and thermionic energy conversion. This work presents a spectroscopic study of photo- and thermionic electron emission from nitrogen doped diamond films on silicon substrates. In this experiment the diamond samples are heated from 100 ° C to 500 ° C, while being illuminated with light from 240 to 600 nm. The emission spectra show a significant increase of photo-emission intensity with elevated temperature and a lowering of the effective work function. The results are discussed in terms of the photo and thermal excitation, the carrier transport and the electron statistics. The results indicate the potential of diamond films in a combined photo and thermionic energy conversion solar cell. This research is supported through the Office of Naval Research.

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