# AbstractID: 9046 Title: Suitability of Synthetic Diamond Films for Radiotherapy Dosimetry

**Purpose:** To investigate the suitability of synthetic diamond films as detectors for radiotherapy dosimetry.

**Method and Materials:** A range of commercially available diamond films grown by chemical vapor deposition (CVD) have been studied using spectroscopic, microscopic and electrical characterization techniques, including Raman spectroscopy, optical, secondary electron, and atomic force microscopy. Diamond detectors incorporating Perspex have been fabricated in order to examine various response characteristics, especially transient behavior and priming effects, due to material defects, interface phenomena, etc. Initial dosimetric characterization was performed using a 6 MV photon beam from a Varian 600C linac. Measurements were achieved using a 2570/1 Farmer Dosimeter and a Keithley 6430 SourceMeter. EGSnrc code was used to model simple device structures to assess performance issues that may impede proper measurements e.g. sources of fluence perturbation, absorbed dose distribution, and charge collection efficiency.

**Results:** I-V measurements of polycrystalline diamond films with Ag contacts tested under a ±210 V bias sweep exhibited nonlinear behavior as expected. High leakage currents were a problem for some detectors. Resistivity measurements at 100 V from one manufacturer of films spanned from $10^{11}$ to $10^{12}$ Ω·cm. Dependence on fluence and fluence rates between 50 - 250 MU/min was observed. However, angular dependence appeared to be negligible. Overshoot was also seen during initial exposure, as well as the well-known priming effect as the signal evolved over time. EGSnrc models have illustrated how electrode thickness alters the dose delivered to the sensitive volume.

**Conclusion:** Experiments will continue to explore the response phenomena of CVD diamond films to evaluate their suitability as detectors for medical applications. The films studied thus far have exhibited typical behavior as seen in previous literature. A thorough characterization of a variety of CVD films and their consequential responses is underway in order to mitigate or ideally eliminate inherent shortcomings.