INVESTIGATION OF GASEOUS ELECTRON MULTIPLIERS WITH MAGNESIUM PHOTOCATHODES FOR OPTICAL TRIGGERING OF BACK-LIGHTED THYRATRONS *

Esin B Sozer, Chunqi Jiang and Martin A. Gundersen
University of Southern California
Los Angeles, CA 90089

Developing reliable and compact optical triggering systems for back-lighted thyratrons (BLTs), light-activated pseudospark switches is of interest for applications of compact pulsed power [1]. Investigation of the electron multiplication methods is crucial for utilization of low-intensity light sources, including ultraviolet (UV) light emitting diodes (LEDs) [2], as optical sources for triggering BLTs . Recent advances on gaseous electron multipliers(GEMs) whose operation is based on gas multiplication within small, sub-millimeter to millimeter diameter holes has shown multiplication gains of 10^3 in both atmospheric and low pressure gas mixtures and noble gases [3, 4].

In this work, we present investigation of GEM type triggering units with magnesium photocathodes for triggering BLTs. Quantum efficiency (QE) of magnesium under BLT relevant pressure conditions (upto 100 mTorr) were measured to be 10^5. [5]. Higher quantum yield was demonstrated for utilization of Mg photocathode compared to Cu and Mo photocathodes. Measurements of the gaseous electron multiplication in argon and helium within the pressure range of 200 mTorr to 1 Torr are presented. Possible schemes for integration of such electron multiplier units with metal photocathode materials to the switch are discussed.

1. Jiang, C., A. Kuthi, and M.A. Gundersen, *Toward ultracompact pseudospark switches.* Applied Physics Letters, 2005. **86**(2): p. 024105-3.
2. Lunev, A., et al. *A 110 mW AlGaN-based UV lamp emitting at 278 nm*. 2005. Santa Clara, CA, United states: Institute of Electrical and Electronics Engineers Inc.
3. Chechik, R., et al., *Thick GEM-like hole multipliers: properties and possible applications.* Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 2004. **535**(1-2): p. 303-308.
4. Shalem, C.K., et al., *Advances in thick GEM-like gaseous electron multipliers Part II: Low-pressure operation.* Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 2006. **558**(2): p. 468-474.
5. Sozer, E.B., et al., *Quantum efficiency measurements of photocathode candidates for back-lighted thyratrons.* Dielectrics and Electrical Insulation, IEEE Transactions on, 2009. **16**(4): p. 993-998.

* Work supported by Air Force Office of Scientific Research