

Chun Huang, Dr. Qingsong Yu An experimental investigation of low temperature plasma sterilization, treatment and polymerization process, Dissertation, University of Missouri-Columbia, August 2006

ABSTRACT: This dissertation focuses on investigation of low temperature plasma processes occurring in non-thermoequilibrium glow discharges. Different types of glow discharges including atmospheric pressure direct current (DC) plasma, low-pressure DC plasma, and low-pressure radio frequency (RF) plasma are investigated with respect to their suitability for surface sterilization, modification, and polymerization. It was found that atmospheric pressure plasma is very effective in destruction of organisms and surface modification of conventional polymers. The bacteria cell destruction efficiency of atmospheric pressure plasma is highly dependent on the amount of oxygen in the gas mixture and the types of supporting media. The role of plasma polymerization and its relevance to aging phenomena encountered in gas detectors were investigated using low-pressure DC plasma systems. In DC plasma polymerization process, the majority of plasma polymer deposition occurs on cathode surface, which is attributed to cathodic dissociation glow. Meanwhile, the negative ionization glow deposition also takes place and hence the plasma polymer deposition is also found on anode surface, which is related to the aging effects of gas detectors. Research effort was also given to the study of RF plasma deposition of protective coating layer to polymeric materials. FTIR-ATR analysis characterized that plasma deposition of tetramethyldisiloxane (TMDSO) produced SiO_x like hard films. Improved hardness and durable adhesion of the plasma deposited hard coatings were achieved on polymeric substrates.

Chun Huang