Candidate:  
Michael Joyce
For the degree of:  
Doctor of Philosophy
Department:  
Chemical and Paper Engineering

Title:  
Flexographic Printing of Conductive (Ag) Inks onto PDMS: The Characterization of Process Parameters and their Improvement for Creating Printed Electronic Devices

Committee:  
Dr. Paul D. Fleming, Chair
Dr. Alexandra Pekarovicova
Dr. Massood Atashbar
Dr. Xiaoying Rong

Time/Place:  
Thursday, May 12, 2016  
2 to 4 p.m.  
A120 Parkview Campus

There is a need for a better understanding of the interactions between functional inks and substrates, which are required to optimize printability, mechanical, and functional properties for the creation of more robust and efficient printed devices. This body of work aims to advance the knowledge of the material properties of poly-di-methyl-siloxane, PDMS, films, their interactions with flexo inks, and their flexographic printability. As adhesion of metals (i.e., Ag & Au) is a known area of interest pertaining to PE, this work will focus on the characterization and optimization of the properties known to promote the adhesion between materials, and their effects on the functional performance of printed conductive ink films. PDMS is an especially important substrate for use in the creation of biocompatible sensors and devices, which is an area predicted to experience much growth in the coming years. But, PDMS has known complications pertaining to adhesion. To accomplish this goal, three studies have been designed: 1) The characterization of surface treated filled and unfilled PDMS films, 2) The flexo process parameter contributions to the printability of PDMS films with a solvent based conductive ink, and 3) the ink property contributions to conductive ink printability on PDMS films. Print trials will be performed using a Harper QD Laboratory Flexographic proofing press. PDMS
substrates will be formulated in house using Sylgard 184, a commercial product from Dow Corning. The results of these studies provide information on the influences of material properties and processing parameters on the printability of PDMS films.