



**University
of Victoria**

Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Applied Science

of

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BSc (K. N. Toosi University of Technology, 2008)

“Development of a Multifunctional Dressing for Epidermal Wound
Monitoring and On-Site Drug Delivery”

Department of Mechanical Engineering

Wednesday, August 16, 2017
3:00 P.M.
Engineering Office Wing
Room 230

Supervisory Committee:

Dr. Mohsen Akbari, Department of Mechanical Engineering, University of Victoria (Supervisor)
Dr. Stephanie Willerth, Department of Mechanical Engineering, UVic (Member)

External Examiner:

Dr. Patrick Nahirney, Division of Medical Sciences, UVic

Chair of Oral Examination:

Dr. Allan Mitchell, Department of English, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

The treatment of epidermal wounds, particularly chronic wounds, is one of the most ubiquitous medical challenges and has imposed a considerable financial burden on the global health care system. Several factors in epidermal wounds lead to severe medical conditions among which infection comprises a large number of mortalities. To tackle this issue, great efforts have been made in the last decades to incorporate antimicrobial agents into wound dressings in order to inhibit microorganism colonization. Additionally, various wound monitoring systems have been developed to detect and track infections using different indicators such as bacterial by-products. However, the integration of these infection sensors with wound dressings – most of which have benefited from electrochemical detectors – has been a major bottleneck due to the electrode failure in the wound environment and the need for electrical power supply. Other approaches have focused on the development of point-of-care devices that simplify the detection of infection. This study tries to address the aforementioned challenge by developing a multifunctional hydrogel-based wound dressing for on-site infection monitoring and delivering gentamicin antibiotic to the wound site. Taking advantage of wound acidity as an indicator of bacterial infection, the developed wound dressing is composed of an array of colorimetric pH sensors to detect wound infection. Moreover, the inclusion of antibiotic-loaded components into the wound dressing facilitates bacterial eradication with reduced side effects compared to the systemic administration of the drug. This incorporation of antibiotic delivery along with the simple colorimetric infection detection holds a great promise for managing acute and chronic wounds by inhibition of bacterial growth and monitoring infection in real-time without a need for dressing removal.