ABSTRACT

TITLE:	An Examination of Electron Field Emission from Porous Silicon
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PRESENTED AT:	2016 Undergraduate Research and Creative Activities Symposium, Fort Lewis College

ABSTRACT: Electron field emission from a collection of porous silicon (PSi) samples was studied in this project. This project also focused on the design of anodization equipment and the production of PSi. A numerical model was made in Matlab to describe Fowler-Nordheim electron field emission from PSi emitters. Silicon wafers were etched with different current densities and etching times. Electron field emission current measurements were taken for two of the samples. Field emission was observed from one sample which was etched for 30 seconds with a current density of 30 mA/cm2 and in a 49% hydrofluoric acid and ethanol solution. This sample's current and voltage characteristics were plotted as a Fowler-Nordheim curve and were determined to be linear, which strongly indicates field emission. In ongoing work, an atomic force microscope will be used to attempt to correlate the pore size, density of pores, and thickness of the porous layer to the observed electrical properties. The results obtained will then be correlated with the Matlab model. The main goals of this research are to produce porous silicon with favorable electron field emission characteristics and to determine which samples have the best field emission properties. This provides the possibility to maximize field emission current for a given applied voltage on a sample of porous silicon. In the future, students may continue testing the parameter space that was created and may discover the conditions which are needed to maximize field emission from porous silicon emitters.