CONTENTS

List of Figures and Tables.................................................................X

Abstract............................................................................................xiii

1. Introduction and Survey of Literature.............................................1
   § 1.1 Introduction.............................................................................1
   § 1.2 Electron-Solid Interactions.....................................................2
      o 1.2.1 Elastic Scattering of Electrons with an Atom......................2
      o 1.2.2 Inelastic Scattering of Electrons in Solids..........................6
      o 1.2.3 Monte Carlo Method........................................................10
   § 1.3 Lithography, The Art.............................................................12
      o 1.3.1 Lithographic Strategies....................................................13
      o 1.3.2 Photolithography..............................................................14
      o 1.3.3 X-ray Lithography.............................................................15
      o 1.3.4 Electron-Beam Lithography..............................................16
      o 1.3.5 Ion-Beam Lithography......................................................16
      o 1.3.6 Resist Materials and Processes.........................................17

2. Monte Carlo Simulations...............................................................18
   § 2.1 Principles..............................................................................18
   § 2.2 Models..................................................................................21
      o 2.2.1 Multiple scattering model...............................................21
      o 2.2.2 Single scattering model...................................................21
      o 2.2.3 Hybrid Model..................................................................22
      o 2.2.4 Direct simulation model..................................................23
      o 2.2.5 Dielectric function model................................................24
   § 2.3 Monte Carlo Simulations of Single Layer materials...................25
      o 2.3.1 Electron Scattering..........................................................27
      o 2.3.2 Scattering Angle..............................................................28
      o 2.3.3 Step Length...................................................................29
      o 2.3.4 Energy Loss...................................................................29
      o 2.3.5 Parameters used in our simulation.....................................31