## Contents

1. **Introduction**  
   1.1. Oxidation of Mg – from the past to today  
   1.2. Quantitative analysis of thin oxide layers with X-ray photoelectron spectroscopy  
   1.3. The scope of this thesis  

### Part I

2. **Quantitative analysis of the plasmon loss intensities in x-ray photoelectron spectra of magnesium.**  
   Abstract  
   2.1. Introduction  
   2.2. Experimental  
   2.3. Calculation of the Mg 2p spectrum  
   2.4. Results and discussion  
   2.5. Conclusions  

3. **Determination of the intrinsic bulk and surface plasmon intensity of XPS spectra of magnesium.**  
   Abstract  
   3.1. Introduction  
   3.2. Theoretical background  
   3.2.1. Alternative method for determination of $\alpha$ and $\beta$  
   3.3. Experimental  
   3.3.1. Base material and sample preparation  
   3.3.2. Oxidation experiments  
   3.3.3. XPS measurements  
   3.4. Data evaluation  
   3.5. Results and discussion  
   3.6. Conclusions
Part II

4. The initial oxidation of magnesium.

Abstract

4.1. Introduction

4.2. Experimental

4.2.1. Specimen preparation

4.2.2. Oxidation experiments

4.2.3. XPS measurements

4.2.4. Ellipsometry

4.2.5. High resolution elastic recoil detection analysis (HERDA)

4.2.6. Other techniques

4.3. Data evaluation

4.3.1. XPS

4.3.2. Ellipsometry

4.3.3. HERDA

4.4. Results and discussion

4.4.1. Oxide thickness and growth

4.4.2. Oxide composition

4.4.3. The oxidation state of magnesium; position and shape of the oxidic Mg 2p peak

4.4.4. Band gap of the oxide

4.5. Analysis of the oxidation kinetics

4.5.1. Theoretical Background

4.5.2. Fit procedure and results

4.6. Summary

Appendix

5. Zusammenfassung

5.1. Teil I

5.1.1. Kapitel 2

5.1.2. Kapitel 3

5.2. Teil II

5.2.1. Kapitel 4
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>References</td>
<td>122</td>
</tr>
<tr>
<td>Curriculum Vitae</td>
<td>127</td>
</tr>
<tr>
<td>Danksagung</td>
<td>128</td>
</tr>
</tbody>
</table>