Table of contents

Abstract I
Kurzfassung II
Table of contents III
1. Introduction 1
2. State of the art 4
2.1. Definition 4
2.2. Metal-foam production routes 4
2.2.1. History of the development of metal foams 4
2.2.2. Open-cell metal-foam production routes 5
2.3. Characterization of metal foams 7
2.4. Mechanical properties of metal foams 9
2.4.1. Compressive behaviour 9
2.4.2. Gibson-Ashby foam model 10
2.4.3. Failure behavior of open cell metal foams 15
2.4.4. Anisotropy of metal foams 18
2.4.5. Scale effects 18
2.4.6. Energy absorption behavior of metal foams 19
2.5. Mechanical properties of foam struts 20
2.6. Summary and open questions 22
3. Manuscript 1: Deformation behavior of open-cell stainless steel foams 23
3.1. Overview 23
3.2. Author contributions 23
3.3. Publication notification 23
Deformation behavior of open-cell stainless steel foams 24
4. Manuscript 2: Tensile failure observations in sintered steel foam struts revealed by sub-micron contrast-enhanced microtomography 44
4.1. Transition 44
4.2. Author contributions 44
4.3. Publication notification 44
Tensile failure observations in sintered steel foam struts revealed by sub-micron contrast-enhanced microtomography 45
5. Manuscript 3: Single steel strut mechanical testing: challenges and future research directions 70
5.1. Transition 70
5.2. Author contributions 70

5.3. Publication notification 70
Single steel strut mechanical testing: challenges and future research directions 71
6. Manuscript 4: Strain hardening reduces energy absorption efficiency of austenitic stainless steel foams while porosity does not 77
6.1. Transition 77
6.2. Contributions 77
6.3. Publication notification 77
Strain hardening reduces energy absorption efficiency of austenitic stainless steel foams while porosity does not 78
7. Overall discussion 110
8. Conclusions and outlook 114
References 116
Appendix 1. 123