Montanuniversität Leoben

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ANNOUNCEMENT: BACHELOR-THESIS

"Material Models and Metallurgical Properties for Ballistic Applications – A Review of „*Explosion Mechanics*", "*Ballistics*", and "*Survivability*""

Purpose of the Thesis:

Metallurgy, and more broadly the discipline of materials science, constitutes one of the central foundations of modern society and of the technological achievements of the twentieth and twenty-first centuries. These disciplines are not limited solely to the manufacturing process from raw ore to semi-finished products or blanks (such as slabs, billets, sheets, etc.), but also encompass the production of the final component as well as its entire life cycle. To date, research in these fields has predominantly focused on civilian applications, while areas of application within the defence sector have played a subordinate role. In recent years, however, the global security environment has changed such that both regional and major powers increasingly—and in some cases successfully—seek to establish explicit spheres of influence. Against this background, defence-related research is gaining increasing importance, particularly for neutral states such as Austria. From a metallurgical and materials science perspective, the fields of ballistics and explosion mechanics are of particular interest and constitute the thematic core of this work.

Objectives and Scope of the Thesis:

The aim of this work is the structured compilation, analysis, and evaluation of metallurgically relevant materials data and material properties as applied in modern ballistic applications. The content is based on selected contributions from the „***29th International Symposium on Ballistics***", with a focus on the fields of "**explosion mechanics**", "***interior and exterior ballistics***", "***terminal ballistics***", as well as "***vulnerability and survivability***". The primary focus of this work lies on metallic materials and their mechanical and thermal behaviour under extreme dynamic loading conditions, such as those occurring at high strain rates, elevated pressures, and transient temperature increases. Particular attention is given to material models employed in numerical simulations, which are analysed with regard to their metallurgical significance. The objective is to elucidate the relevance of specific material properties and modelling approaches for the simulation of ballistic processes and to place them within a metallurgical and materials science context. This work is intended for students enrolled in an undergraduate degree programme in metallurgy or materials science, mechanical engineering, physics, or related disciplines, who have an interest in high-rate processes, material behaviour under extreme conditions, and numerical modelling. Basic knowledge of materials science and mechanics, as well as an independent and structured working approach, is expected.

Earliest Start Date:

The thesis can be started as soon as possible.

Supervisor and Contact:

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