

Abstract

The CreeS project (“Chromium-free Slag”) addresses the growing need for innovative technologies that enable sustainable, resource-efficient production and support the transition to a circular economy. A key focus is the use of industrial residues to reduce the CO₂ footprint of products. In particular, the cement industry requires alternative secondary raw materials and supplementary cementitious materials to replace primary resources and lower emissions. Stainless steel slags (StS) offer significant potential, but their use has been limited due to high levels of heavy metals, especially chromium (Cr).

CreeS develops a technological concept to produce Cr-free StS that can be reused in the cement industry. Stainless steel slags are an unavoidable by-product of steel production, yet recycling options in Austria remain limited. By selectively removing heavy metals, the project enables new recycling pathways and reintegrates material streams into internal steel industry cycles, contributing to waste reduction and improved resource efficiency.

The process begins with mechanical treatment and an oxidative thermochemical process converting chromium into water-soluble compounds through the injection of O₂ into molten slag. The supportive influence of additives will also be investigated. Subsequently, Cr will be leached from the treated StS, recovered using zero-valent iron (Fe(0)) in a fluidized bed reactor, and fixed in a Fe-Cr hydroxide sludge. This leaching process results in Cr-free StS as well as Fe-Cr-containing sludge.

Both materials are evaluated for their suitability for reuse in the cement and steel industries. Covering the entire value chain - from slag generation to full material utilization - the project contributes significantly to circular economy practices, reduces CO₂ emissions, and conserves natural resources while delivering both environmental and economic benefits.

Master’s Thesis - Safety and Disaster Management

We are offering a Master’s thesis opportunity within the research project *CreeS* at the Chair of Thermal Processing Technology. The thesis can start immediately, and the exact topic will be defined jointly with the student.

The work will focus on safety-related aspects of handling stainless steel slag before, during, and after thermochemical treatment at high temperatures. This includes risk identification, safety assessment, and the development of appropriate safety measures for laboratory-scale processes. In addition, the thesis will include a technical component, such as supporting the design and planning of an experimental laboratory setup for thermochemical treatment. The student will gain hands-on experience in experimental work and process development in a research environment.

A technical bachelor’s degree is a prerequisite for this master’s thesis.

