

Bachelor- / Master- Thesis

Investigation powder flow property impact on consolidation and shearing during friction extrusion processing Al-Cu powder

Helmholtz-Zentrum Hereon, Institute of Materials Mechanics, Solid State Materials Processing (WMP)



Introduction

Friction Extrusion is a solid-state processing technology involving severe plastic deformation and frictional heating that can form fully consolidated extrudates. Heat is generated by the friction between the die and charge material, which eliminates the pre-heat treatment compare to the conventional extrusion. Due to its advantages and abilities, less energy consumption, diverse feedstock material (e.g. metal chips, scraps, powder or bulk) as well as superior materials properties can be obtained (such as higher ductility). One of the advantage of using powder feedstock is able to customize the alloy composition, which allows tailoring the desired material property.

The aim of this thesis is to determine the impact of flow properties on both consolidation and extrusion behavior during processing of Al-Cu powder. More specifically, the higher flowability is expected beneficial for the consolidation of the feedstock powder while hindering shear introduction at the die-charge interface. The influence of these divergent effects on the microstructure obtained in the friction extrusion process will be determined by using powders of different shape.

The place of employment would be the Helmholtz-Zentrum Hereon in Geesthacht.

Tasks

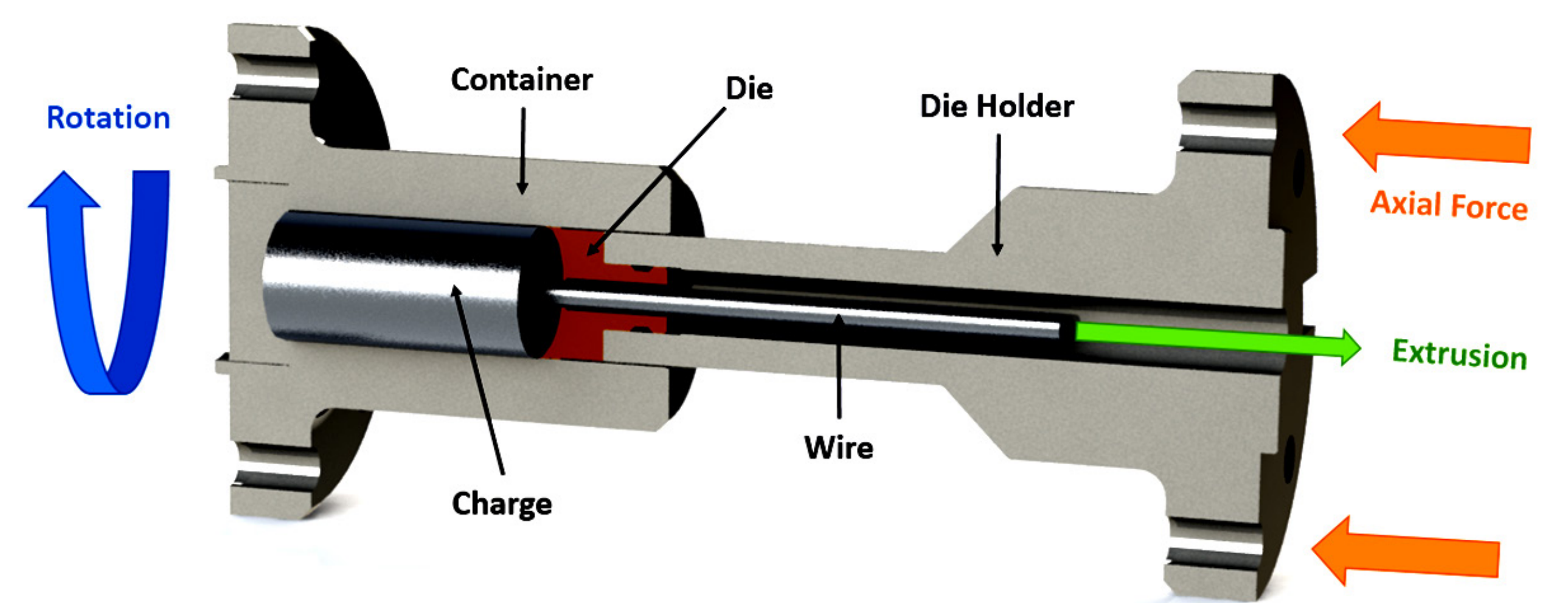
- Literature research (e.g. friction extrusion, powder metallurgy and material flow property).
- Development of the experimental design and execution of the desired experiments including extrusion data acquisition as well as mechanical and metallographic characterization.
- Presentation of the results and documentation of the experimental work (in English).

Contact

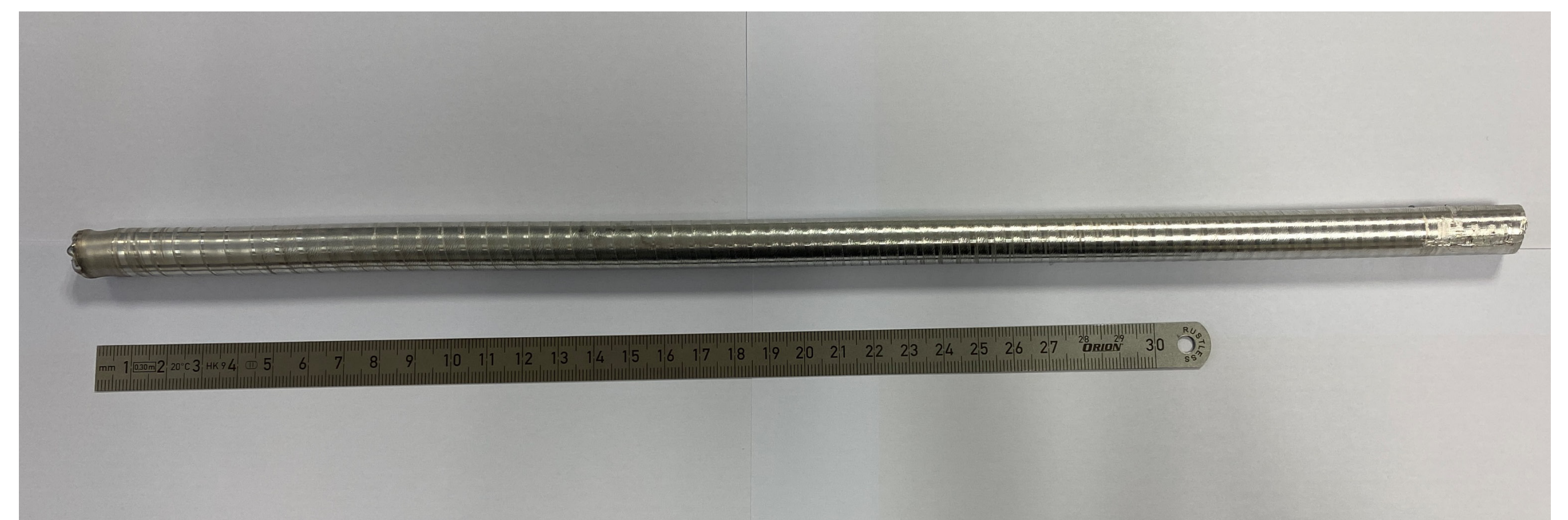
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Schematic illustration of the friction extrusion process. First, the friction between the rotating container and the stationary die heats up and plasticize the charge material. Then the axial force initialize the extrusion to from fully consolidated extrudates.



Friction extruded aluminum wire in as-extruded state.