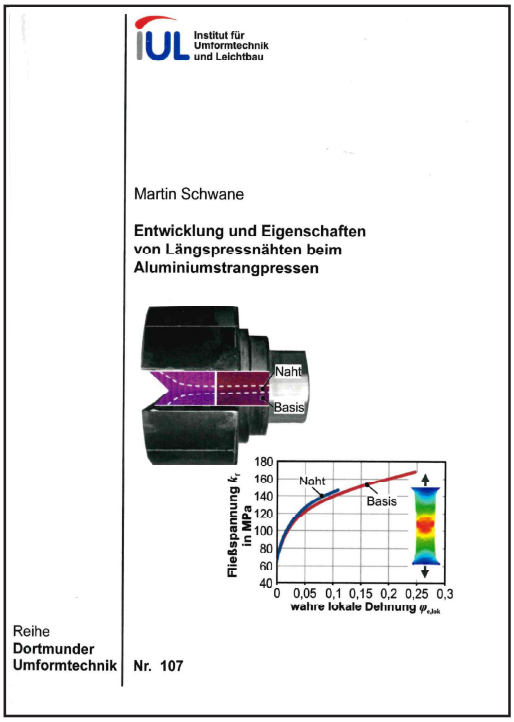
English version below

Entwicklung und Eigenschaften von Längspressnähten beim Aluminiumstrangpressen

Martin Schwane



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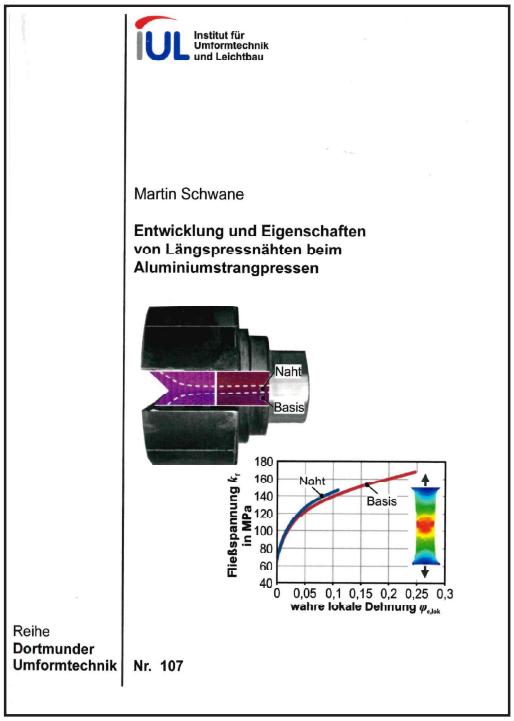
Zusammenfassung

Aluminium hot extrusion is an established manufacturing process for the production of semi-finished parts which are used in a wide variety of industrial sectors. Hot extruded hollow and multi-chamber profiles are important lightweight components, especially in automotive, commercial vehicle and aircraft construction. In the common process variant of hot extrusion using porthole dies, a solid state welding process inevitably results in longitudinal weld seams which run over the entire length of the profile. Since the mechanical integrity of profiles can be impaired by longitudinal weld seams, there is great interest in a scientific analysis of the fundamental interrelations that lead to the development of the weld seam properties. These have not been completely understood yet.

The aim of this thesis is to contribute to a further understanding of the formation and development of the final properties of longitudinal weld seams. By means of numerical analyses, the relationship between the adjustable global process parameters and the local variables in the welding chamber is initially investigated. The relevant parameters for the solid state welding process under typical hot extrusion conditions are then identified using a model test rig developed within the scope of this thesis. A new phenomenological welding model is derived for the quantitative description of the observed interrelations. This model is subsequently used to estimate critical welding conditions in the process-related investigations. As a result of the conducted extrusion trials, deviating mechanical properties between the weld area and the base material can be quantified, whereby the tool design is identified as an essential parameter for the geometric characteristics of the weld area. Strength differences can be proven in all considered ageing states.

Formation and properties of longitudinal weld seams in aluminum hot extrusion

Martin Schwane



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