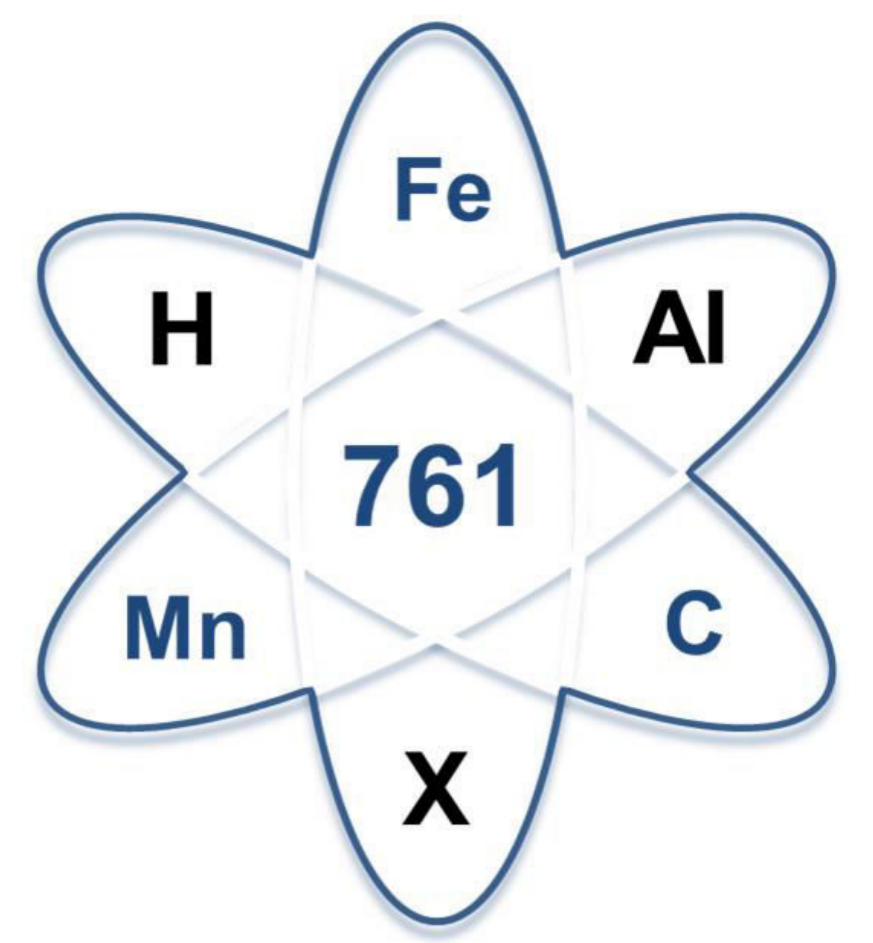


B1 Experiments of solidification and high temperature embrittlement

Solidification, segregation and high temperature mechanical behavior



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Target 3rd Phase

Content

- Experimental simulation of the continuous casting process
- Production and investigation of technical (vacuum metallurgy) and high purity (slow solidification) Fe-Mn-C-X alloys
- Investigation of high temperature embrittlement in the simulator for continuous casting
- Influence of dynamic thermal gradients in the development of the solidification structure and on the cracking behaviour
- Determination of hydrogen in the liquid phase within the system Fe-Mn-C-X

Methods

- Production of model material with special volumes and varied parameters (cooling rate, convection, overheating)
- Analysis of samples with light optical and electron microscope and EDX
- Prediction of the solidification structure and segregation with the CALPHAD-method
- Methodology to describe the phenomenon of segregation
- Determination of high temperature characteristics with a simulator for continuous casting process and bending and with a platter ingot mold

Input

A3: Data for liquidus and solidus temperature and distribution coefficient

A5: Identification of the investigate alloys

A8: Development of solidification structure and the high temperature material characteristics

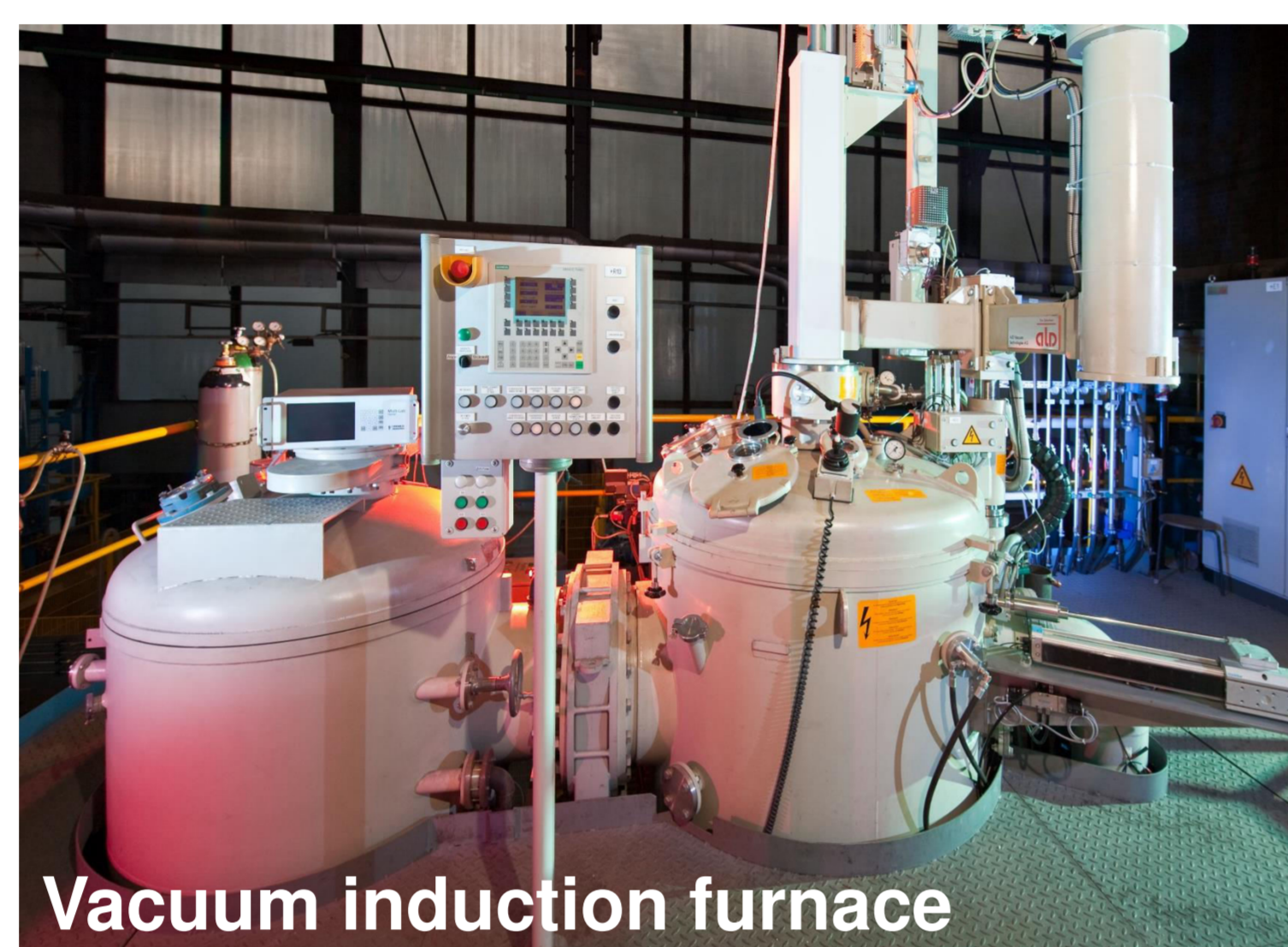
B4: Experiments for grain growth and bicrystals

B6: Exchange of testing parameters

C1: Analysis of the material with electron beams

C2: Mechanical behavior up to 550 °C

C3: Nano indenter measurement

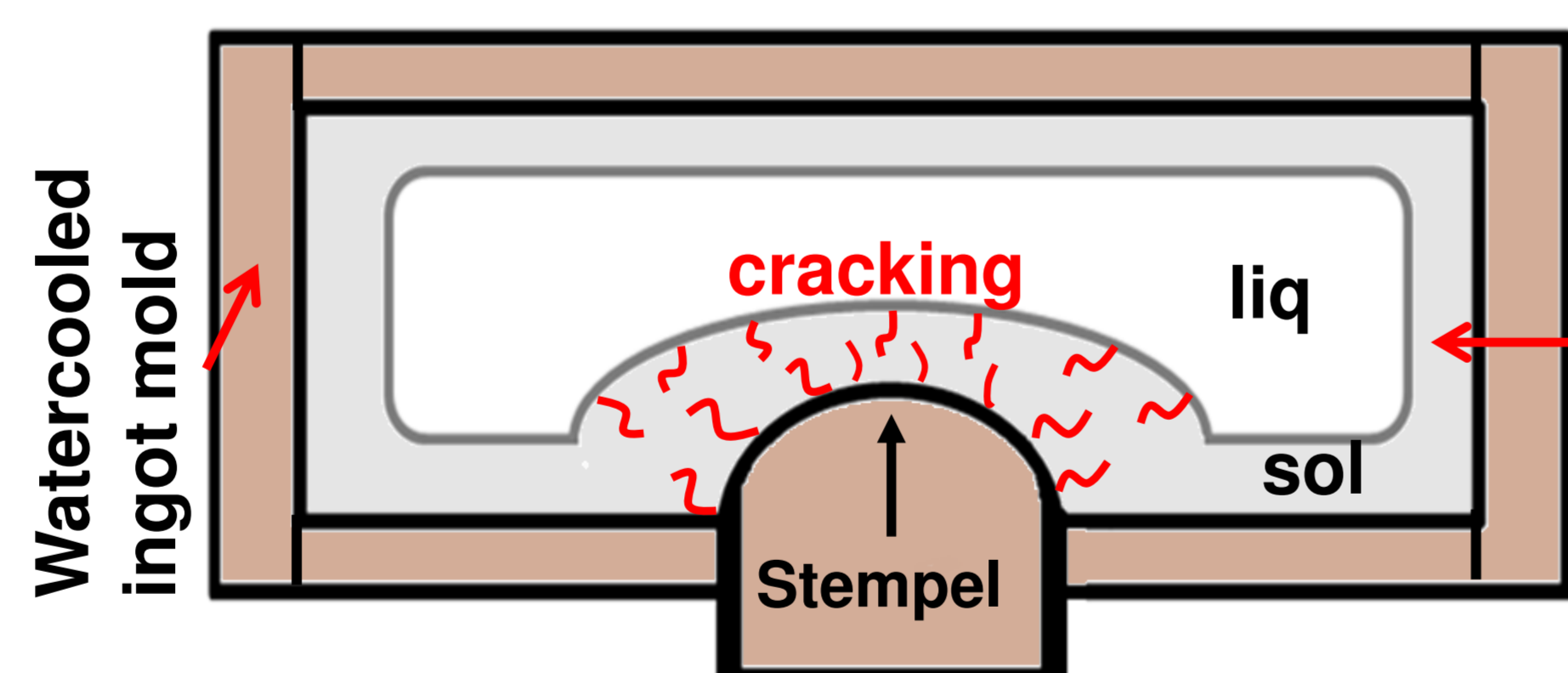


Vacuum induction furnace

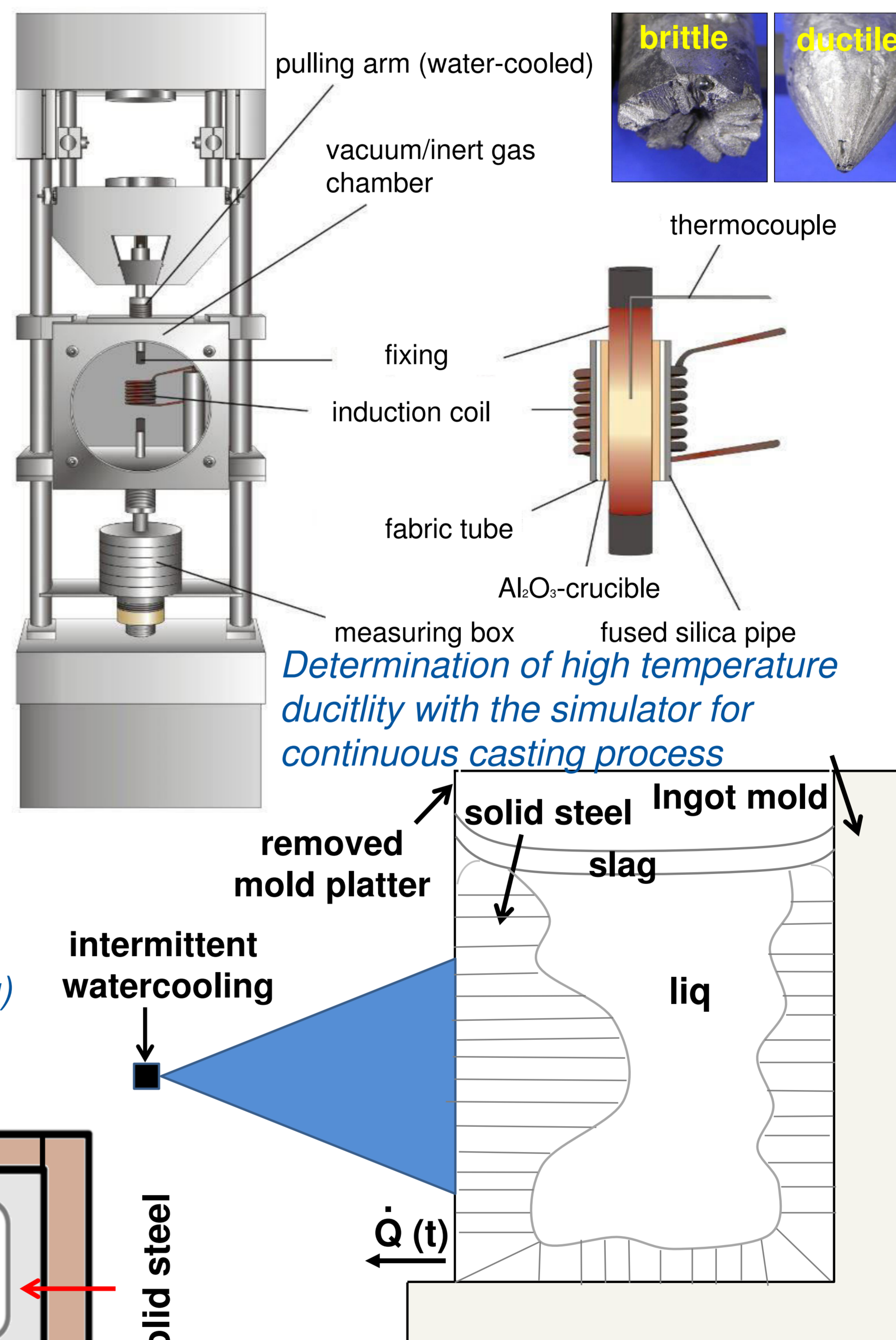


Slow solidification furnace

above: vacuum induction furnace 4 (100 kg)
bottom: slow solidification furnace



Advancement of a "crushing mold" to simulate the bending in the continuous casting process



Determination of high temperature ductility with the simulator for continuous casting process

Influence of dynamic thermal gradients on the development of structure and cracking

Output

A3: [H]-solubility, phase composition, coefficient of segregation

A8: Structure, segregations, fractography of cracking and ductility value

B4/C2/C3: Sample material out of slow solidification

B6: Material, comparison of casting structure and Know-How transfer

C1: Sample material with vacuum metallurgy and slow solidification

C2: Mechanical behavior up to 600 °C

T3: Reference material with ingot casting

Target/Impact

- The results of the investigation of the high temperature embrittlement and the experiments for solidification and the scientific findings have a great interest concerning to industrial production of HMnS with continuous casting.
- Constructive on the production of model materials with vacuum metallurgy (**B2, C1, T3**) and slow solidification (**B4, C1, C2**) the high temperature characteristics are determined up to T_{Sol} as extension to the TP C2, which investigates the mechanical behavior up to 600 °C.

Work packages

WP 1: Preparation: Adaptation to the new concept of allows Fe-Mn-C-X

WP 2: Melting and solidification experiments: Determination of hydrogen in molten steel, CET, sample production

WP 3: Experimental investigation of high temperature characteristics directly after solidification

WP 4: Characterization: Description of solidification-, micro- and macro-structure, fractography of tensile tests

WP 5: Mapping and process modelling: CALPHAD-method, implementation of RaLa- and RaIn-models



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