Feedstock and Recycling

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Raw material production and Recycling

are executed to optimise the reheating process itself and to make it more reliable. Aim of the raw material production for semi solid processing is the preparation of fine globular grain embedded in a melt. Raw material with this structure has good prospects to show thixotropic behaviour during the forming process. Thereby the viscosity is decreasing under the influence of shearing strength. The appearing grain structure – after forming a component – is provable by means of metallography. Different processes are used in order to produce this structure. The processes are distinguished by the mechanisms of the grain refining: mainly chemical and physical grain refining occurs. Physical grain refining, like mechanical stirring and magneto-hydro-dynamic processing is characterised by homogeneous nucleation of similar natured grain centres. In contrast an alloy is used for chemical grain refining. The grains of the alloy are reacting with the melt under the formation of insoluble seeds with an other chemical composition as the melt. These grains provide free contact surfaces which facilitate the grain growth (heterogeneous nucleation). Beside this common techniques, the strain induced melt activated (SIMA) and the slug on demand (e.g. SSP) processes have to be mentioned. The SIMA-process is producing dislocations within the raw material by deformation. This dislocations are providing the grain refining effect by subsequent reheating to the semi solid state. As opposed to the mentioned methods the fine globular structure is obtained by cooling the melt in the semi solid state within the SSP-process. The grain refining effect results by cooling the melt and should be developed by homogeneous nucleation without grain refining additions. The most common process for raw material processing is the MHP-process. Physical grain refining is used by electro-magnetic stirring during DC-casting. During casting a surface is formed at the outer edge of the bar. From the surface dendrites are growing in centre direction. The flow within the melt is cutting some of the dendrites. The fractured dendrites are operating as additional grains and are supporting the grain refining effect in this way. Within this sub-program chemical grain refining, SIMA-process as well as SSP-process are investigated.

The first aim of the recycling research is stock taking. Furthermore closed-loop recycling of production residues is investigated in order to develop standard procedures for improvement of recycling under equal product quality. Included is the characterisation of residues which are not internal recyclable. Alternative recycling routes for those residues have to be developed.