Success Story
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Amoree /K-Project

Aluminium and magnesium processing optimisation with special respect to resource and energy efficiency

Programme: COMET – Competence Centers for Excellent Technologies
Programme line: K-Projects
COMET subproject, duration and type of project:
Amoree, 07/2014 – 06/2018, single-firm

W-tempering and hot stamping of Al-7xxx alloys

For the production of components made of high strength aluminum alloys of the 7xxxx group process routes are needed that supports the performance potential of these alloys.
By the examining and the investigation of the whole process chain to produce car body components, single process steps can be used to realize desired material property's, they are important for subsequent steps. This gives the objective of energy efficient process management whit a maximum of component performance.

Efficient view of the process chain for the forming of AW- 7xx alloys

Within the Amoree project, investigations on heat treatments of AW-7075-T6 and AW-7021-T4 based on the forming process of W-temper and hot stamping has been carried out. The Solution heat treatment was first investigated due to its relevance to the above mentioned forming processes. Solution heat treatments of 480°C/15 min for AW-7075 and 515°C/5 min for AW-7021 are needed to achieve full saturated solid solution in the sheet materials.

The cooling rate during heat treatment has an influence on the material properties of both alloys. It was found that hardness increases with increasing cooling rate. AW-7075 alloy shows a higher cooling rate sensitivity with a critical cooling rate of more than 300 K/s compared to AW-7021 with a critical cooling rate around 10 K/s.

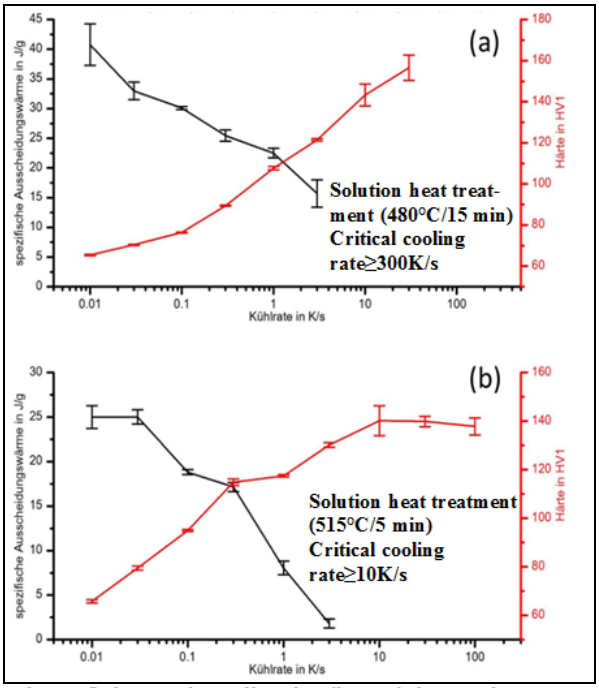

Fig. 1: [Please describe the figure/picture (copyright)]

bmwfw Federal Ministry of Science, Research and Economy

bmvit Austrian Ministry for Transport, Innovation and Technology

The Cooling rate during hot stamping is depending on the heat transfer between sheet and tool. An average cooling rate of 50K/s was realized using the tool at LKR to form test parts which affect all further process steps.

Stabilization of AW- 7xx alloys

The investigation on the stabilization heat treatment highlights out that depending on temperature and holding time, specific material properties can be adjusted. These specific material properties are important for the following process step of mechanical joining.

Impact and effects

Considering the whole process chain the heat treatment of paint baking is the last step which affects the end characteristic of the whole part. This is used to increase the yield strength of AW-7075 near to T6 and AW-7021 near to T4 conditions.

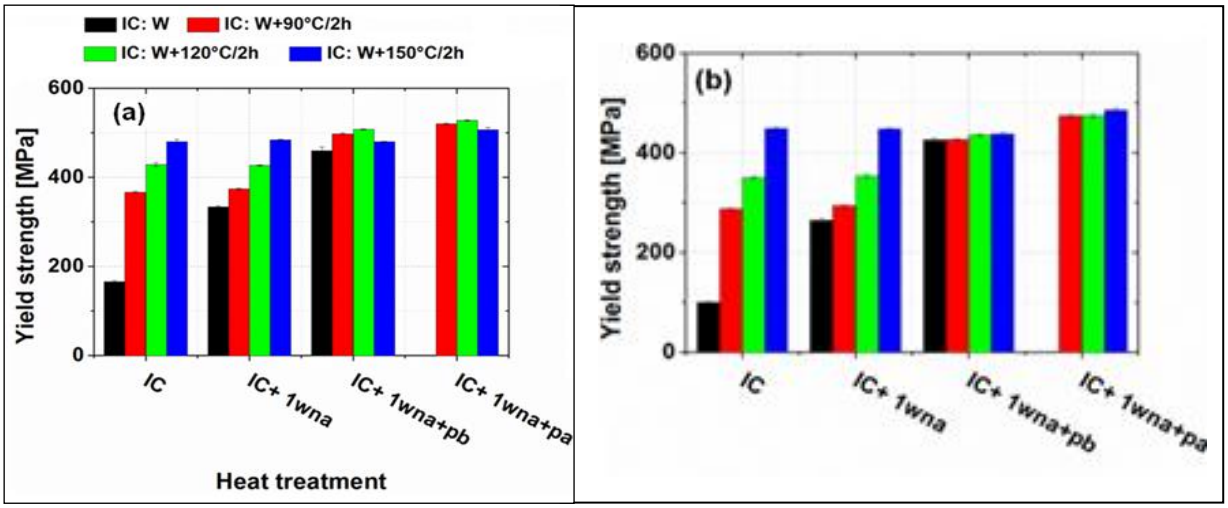

Fig. 2: (a) yield strength of AW-7075 (b) yield strength of AW-7021; in dependence on heat treatment; IC: initial condition; W- solution heat treated and water quenched; 1wna- 1 week of natural ageing (storage); pb- paint baking heat treatment (185°C/20 min); pa- peak ageing (120°C for 24 h)

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Non ferrum GmbH	SZG