points per sample was compared to the data acquired with the post-processing routines of simulated results. The model was able to simulate the process and generate temperature data, which differed from the experimental results by values between 250ºC and 100ºC for the maximum achieved temperature.

ACEX332
Dr. Jung han Song
Metal Forming Technology R&D Group,
Korea Institute of Industrial Technology (KITECH),
Incheon, Korea

Planar Anisotropy Evaluation of the Al5052 Alloy Sheets with Plane Stress Yield Functions

J. H. Song1, G. A. Lee1, S. J. Park2, H. W. Lee3
1Metal Forming Technology R&D Group, Korea Institute of Industrial Technology (KITECH), Incheon, Korea.
2Dept. of Mechanical Engineering, Korea National University of Transportation, Chungju-si, Korea.
3Dept. of Energy System Engineering, Korea National University of Transportation, Chungju-si, Korea.

An obstacle to broader implementation of aluminum alloys in transportation industries is the superior formability of less costly steel alloys. Enormous potential benefits in mass reduction for fuel economy improvements with light weight, nonferrous alloys have stimulated novel approaches to forming complex aluminum components. In this paper, planar anisotropy of the new Al50552 alloy, called Eco Al5052, was evaluated experimentally. Compared with conventional Al5052, Eco Al5052 contains a calcium(Ca)-based compound. Uni-axial tensile tests were conducted to measure the r-value with different angles from the reference rolling direction. The planar anisotropy was then modeled with three anisotropic plane stress yield criteria of different complexity and theory bases, i.e., Hill48, Yld89[1] and Yld2000[2]. The results indicate that different yield models distinctly affect the interpolation accuracy. The results indicate that different yield models distinctly affect the interpolation accuracy of the planar anisotropic behaviors. Yld2000 criterion exhibit better agreement with experimental data than those from Hill'48 and Yld89 criteria since it has great extensibility due to the larger number of the mechanical parameters incorporated.

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ACEX358
Dr. Givanildo Alves dos Santos
Department of Mechanical,
Federal Institute of São Paulo,
IFSP, São Paulo, SP, Brazil

Primary Dendrite Arm Spacing Effects upon Mechanical Properties of an Al-3wt% Cu-1wt% Li Alloy

G. A. Santos1, P. R. Goulart1, A. A. Couto2 and A. Garcia3
1Department of Mechanical, Federal Institute of São Paulo, IFSP, São Paulo, SP, Brazil
2Department of Materials Engineering, Institute of Nuclear and Energy Research, IPEN, São Paulo, SP, Brazil
3Department of Materials Engineering, State University of Campinas,

Campinas, SP, Brazil
Corresponding author e-mail: givanildo@ifsp.edu.br

The imposition of a wide range of operational conditions in foundry and castings processes generates, as a direct consequence, a diversity of solidification structures [1, 2]. It is well known that mechanical properties depend on solidification structures. The literature presents relationships between yield strength and grain size, such as the Hall-Petch`s equation, or ultimate tensile strength and secondary dendrite arm spacings [1, 3]. In this work, an Al-3wt%Cu-1wt%Li alloy was solidified under upward unsteady state heat flow conditions. Heat was directionally extracted only through a water-cooled bottom made of steel (SAE 1020). The aim of the present study is to obtain correlations between the as-cast microstructure, solidification thermal variables and mechanical properties of an Al-3wt%Cu-1wt%Li alloy casting. The results include tip growth rate, cooling rate, primary dendrite arm spacing (λ1), ultimate tensile strength (sUTS) and yield strength (sy) as a function of solidification conditions imposed by the metal/mold system. It is found that the primary dendrite arm spacing decreases with the increase in tip growth rate and cooling rate. In both cases (sUTS and sy = 0.2%ε), the finer dendritic arrangement presents superior mechanical properties.
Figure 1: Relationships: sy= f(λ1) (a) and sUTS= f(λ1) (b).

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ACEX271
Dr. Ahmad E. Eladawi
Faculty of Engineering,
Benha University, Egypt

Studying the Workability of AA7075

Hammad T. El-Metwally*, Ahmed E. Eladawy** and Osama M. Erfan***
e-mail : ahmadeladawi@yahoo.com

AA7075 is one of the highesat strength aluminum alloys available. Its strength-to weight ratio is excellent and it is ideally used for highly stressed parts. It is used in aircraft and aerospace structures where a combination of high strength with moderate toughness and corrosion resistance are required. In recent years, improvements in formability of AA7075 are essential to counter the increasable requirements not only in sheet metal applications but also in the bulk forming applications. The current paper is concerned on studying the workability of AA7075 using upsetting test of different specimen geometries and determining their forming limit diagram. The results shows that the AA7075 takes the semi-ductile material behaviors and the fracture is limited by the ratio between the circumferential strains to the longitudinal strains not exceed than - 0.5

ACEX271
Dr. Ahmad E. Eladawi
Faculty of Engineering,
Benha University, Egypt

Temperature Investigation of Aluminum and Aluminum/Silicon using Computer Vision with Gray Level Run Length Matrix