Formability and Strength Enhancement of AA7075 Sheets by Cryorolling and Post-Treatment

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Abstract

Cryorolling, an approach involving severe plastic deformation, offers a means to fabricate aluminum alloy sheets (AA7075) with exceptionally fine grains, conferring greater strength and hardness than those achieved through conventional cold rolling methods. Diverging from established techniques, we introduced a post-cryorolling heat treatment to enhance both the strength and formability of the cryorolled sheets. The formability within the temperature range of warm working was evaluated using parameters such as limiting dome height (LDH) and forming limit diagrams for cryorolled AA7075 alloy sheets. We conducted an analysis of strain distributions and thickness alterations

resulting from biaxial stretching. To infer the mechanical attributes of the produced specimens, we established a correlation between their hardness and ultimate tensile strength. Employing this hybrid approach led to elevated limit stresses and LDH compared to the traditional processing route involving annealing, cold rolling, and room temperature forming. As a result, this method enables the fabrication of aluminum alloy sheet metal components with exceptional formability and high strength. Notably, this alloy exhibits optimal performance for warm forming at 250 °C due to its enhanced formability and post-forming strength when contrasted with annealed sheets and the conventional cold-rolling process.

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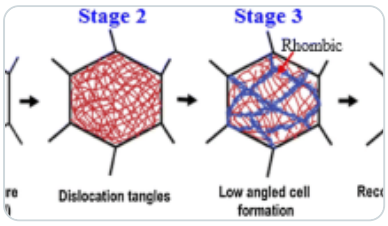

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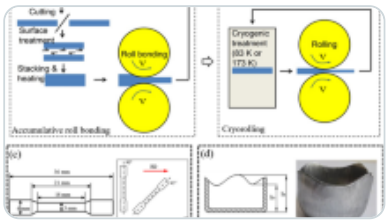

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Ethics declarations

Conflict of interest

There is no Conflict of interest in this research work.

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