Aluminum-magnesium laminates provide promising materials for aerospace and automotive industries

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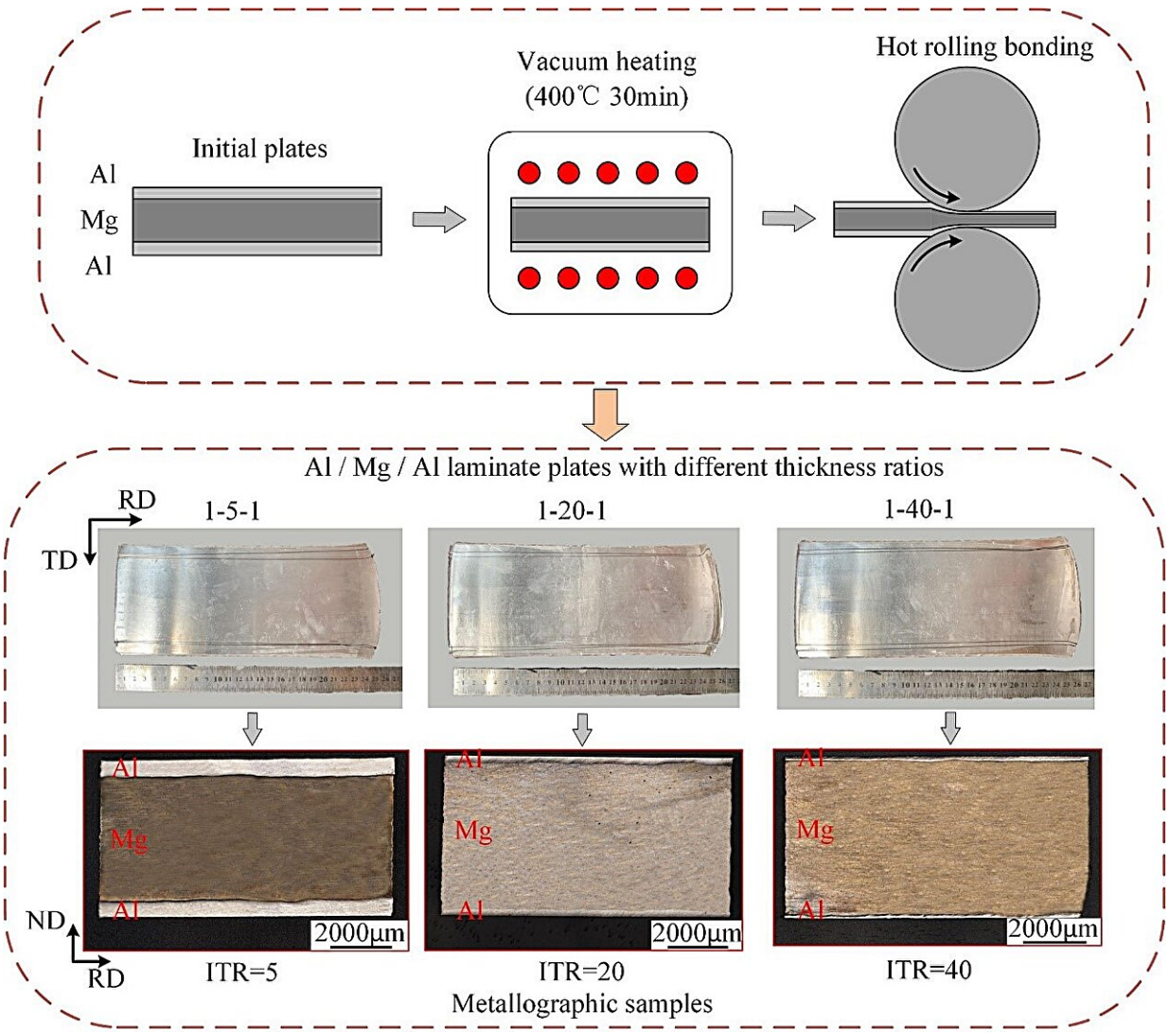

Schematic diagram of large thickness ratio Al/Mg/Al laminate rolling process.

Credit: TranSpread

Magnesium alloys are prized in aerospace, automotive, and electronics for their lightness and strength, but they are limited by poor corrosion resistance. To overcome this, researchers have developed Al/Mg/Al laminates, cladding magnesium with aluminum to combine their strengths: lightness and better corrosion resistance. Various methods such as co-extrusion, casting, and welding have been explored, with rolling emerging as a preferred technique for its flexibility and efficiency.

The study, published in *Transactions of Nonferrous Metals Society of China*, developed Al/Mg/Al laminates with large thickness ratios, presenting significant advancements in mechanical properties and interfacial bonding strength.

The team from Taiyuan University of Technology has discussed the development and analysis of Al/Mg/Al laminates with varied initial thickness ratios (ITR) created through a hot-rolling process. By experimenting with ITRs ranging from 5 to 40, the study explored how changing the ITR affects the stress, strain, microstructure evolution, and overall properties of the laminates.

Findings indicated that an optimal ITR exists—specifically, an ITR of 20—where the laminates exhibit the best comprehensive mechanical properties. This includes maximizing the ultimate tensile strength and yield strength while also achieving high interfacial bonding strength and optimal elongation. Beyond this optimal point, increases in ITR lead to a decrease in interface bonding strength, affecting the laminate's overall performance.

This research contributes to the understanding of how to manipulate laminate composition for enhanced structural applications, particularly in industries seeking lightweight yet strong materials.

Lead researcher, Tao Wang, says, "Al/Mg/Al laminates with large thickness ratios not only fully utilize the lightweight advantages of magnesium alloys, but also significantly optimize the laminate's mechanical properties and corrosion resistance, marking a significant step towards the practical application of these materials in advanced engineering fields."

This breakthrough hints at a transformative future for aerospace and automotive industries, promising materials that are lighter, stronger, and more corrosion-resistant, setting a new standard in composite material development with wide-reaching industrial implications.

More information: Ting LI et al, Hot-rolling process and properties of large thickness ratio Al/Mg/Al laminates, *Transactions of Nonferrous Metals Society of China* (2024). DOI: 10.1016/S1003-6326(23)66359-9

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