Friction stir processing towards high-performance aluminium alloys

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Abstract: Friction stir processing (FSP) is an innovative solution to manufacture metal matrix composites, improving the ductility of alloys or for additive manufacturing. FSP was used to integrate fast-diffusing atoms at a high volume fraction in aluminum to favor its healing potential leading to a complete filling of 70% of all damage (and up to 90% when their initial size is below 0.2 µm). FSP can also significantly improve the ductility and fatigue life of high strength aluminum alloys processed by Laser Powder Bed Fusion. For example, the fatigue life of Scalmalloy was improved by 60% by FSP. The remaining challenge concerns the multi-pass strategies leading to heat affected zones. The enhanced mechanical properties compared to cast or even wrought alloys is associated to the refined microstructure following severe plastic deformation.

Relevant references for some of the already published work:

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