

Designing Aluminum Alloys for a Circular Economy

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Abstract

Aluminum is a circular metal since it can be recycled unlimited number of times without significantly losing its original properties. Furthermore, the aluminum recycling process requires only 5% of the energy needed to produce the primary metal, leading to significant CO₂ and cost savings. The use of recycled aluminum alloys in structural applications will improve the sustainability of the aluminum and manufacturing industries in a circular economy. However, the mechanical and corrosion properties of secondary (recycled) aluminum alloys are often degraded by their high “impurities” accumulated in the use phase and recycling process. This presentation presents a microalloying strategy in designing secondary alloys with higher tolerance of impurity such as iron. Examples are given in secondary aluminum alloy design for die casting and extrusion applications based on an integrated computational materials engineering (ICME) approach.