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Editorial

Light Metals and Their Composites

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1. Introduction and Scope

It is known that metallurgy influences almost all sectors of industry, including energy, aeronautics, automotive, space, chemical, machinery, scientific equipment, construction, packaging, electrical, computing and health. Without metals and alloys, the modern world would be inconceivable and could not function successfully. The importance of lightweighting in the transport sector, as an effective way of cutting greenhouse gas (GHG) emissions, cannot be overstated. As an example of weight-saving potential, a 100 kg weight reduction for a long-haul aeroplane saves about 20,000 gigajoules of energy and 1,900,000 kg of CO_2 emissions over its 30-year lifetime. Similarly, a 100 kg weight reduction for an average car saves about 25 gigajoules and 1600 kg of CO_2 over its 10-year lifetime [1].

2. Contributions

The present issue is devoted to a number of innovative concepts in liquid metal engineering, including additive manufacturing [2–4], which, if successfully scaled-up, would be of major manufacturing significance [5].

The metals of the greatest interest in this issue are light alloys of magnesium (including magnesium alloy and Mg-Li [6] metal) and aluminium (Al-Mg-Mn alloys [7], AA5154 layers intermixed with Mo powders [3], AZ91 [8] and Al-Ca-Zn-Mg with strengthening by nanodiamonds [9]), although it should be appreciated that the proposed methods will also be of high value to other alloy systems (e.g., Ti-6Al-4V alloy) [10,11]. The use of external fields to disperse nanoparticle reinforcers into melts and the subsequent solidification of light alloy nanocomposites are also discussed.

3. Conclusions and Outlook

In this Special Issue, authors not only suggest novel techniques to create light metals with increased properties. but they show a "process-structure-property map" in this field, capable of predicting mechanical, physical, thermal and corrosion properties of relevance to industrial end-users.

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