

Editorial

Casting Alloy Design and Modification

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Castings and the cast metals are among the most important facets creating a foundation for modern life. Castings have been particularly important for effective light and heavy transport as well as for the machinery required for manufacturing. The key factor making this possible is the ability of metals casting to create near net shape manufacturing with a great degree of freedom in design together with the mechanical properties of the alloys. Metal alloys display a unique combination of stiff and ductile behaviour making metals ideal for high performance critical components in transport applications. Current trends in society are resulting in an increased demand regarding performance and weight in the transport sector due to a push towards resource efficiency and emission reductions (40% by 2030 in the European Union [1]). All potential actions lead to weight reduction through either material reduction or material exchange which together always lead to higher stress on the material. This creates a challenge for materials' developers around the world as a stronger material normally is associated with reduced ductility. The increased strength and reduced ductility puts new requirements on the component manufacturers as defect management becomes increasingly more important. The current special issue is a compilation of examples on how these critical challenges can be addressed and represents the cutting edge of understanding concerning material performance and processing of these high performance materials.

The first step is to be able to cast components of appropriate quality. In the current issue there are two papers covering this and the use of simulation to manage layout and process settings. [2,3]. Once the part is produced with appropriate soundness then the microstructure should be suitable for the job. This can be achieved by alloying and by the addition of particles formed *in-situ* and *ex-situ* [4–6]. New processes are also entering the manufacturing scene affording new possibilities to create novel microstructures and thereby also new types of property combinations [6,7]. The introduction of new processes also shifts the boundary between processes that used to be made in fully solid state and now move towards casting and more liquid processing resulting in hybrid processes [6–8]. Independent of this, post treatment processes for bulk and surface properties are still needed to be used together with the novel processing property capability [8,9]. Last but not least, it is also critical to understand the application in which the part is to be used and its implications for the stability of its properties [10].

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