

Editorial

Bainite and Martensite: Developments and Challenges

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1. Introduction

Both microstructures, martensite and bainite, although share some common features, when studied in further detail depict a plethora of subtle differences that make them unique. Tailoring the final properties of a microstructure based on one or the other as well as in combination with others, exploring more sophisticated concepts such as Q & P and nanostructured bainite are the topics of worldwide research. Understanding the key microstructural parameters controlling the final properties, as well as the definition of adequate process parameters to attain the desired microstructures, goes undoubtedly through a proper understanding of the mechanism ruling their transformation and a detailed characterization.

The development of new and powerful scientific techniques and equipment (EBSD, APT, HRTEM) allow us to gain fundamental insights that help to establish some of the principles by which those microstructures are known. The developments accompanying such findings lead to further developments and intensive research providing the required metallurgical support.

2. Contributions

The present Special Issue includes one review paper [1], one technical note [2] and ten scientific papers [3–12]. In all of them, martensite and/or bainite are being studied and in some cases, in combination with other phases.

New processing routes by plastic deformation of austenite previous to transformation, ausforming, is revealed as an emerging and promising alternative to achieve optimized microstructures [1,4]. Development of new steel grades for specific industrial products and existing processing routes [11]. The response of martensitic and bainitic microstructures to more traditional treatments as nitrocarburising [9] or tempering [2,3,5] based on the initial microstructural characteristics. More fundamental studies on the ways and means of phase transformation in specifically designed alloys [6,8,12] and the mechanical response and relationships between microstructure and mechanical properties [2,7,10] are among the topics presented in this compendium.

3. Conclusions and Outlook

Regardless of the sector, the driving force that moves and promotes development in the field of materials is the search for better properties at a lower cost and with less environmental impact. Some of us are lucky enough to work with one of the cheapest, most versatile and oldest materials available, steel. Even to this day, there exists in certain circles, the belief that everything in the world of steel is already investigated. The works presented here are not more than the tip of an iceberg that come to demonstrate the little foundation of such affirmations and the good technical and scientific health that this material enjoys.

As a guest editor, I would like to express my sincere thanks to all my colleagues for supporting this initiative and share their latest developments, making this Special Issue a total success.

Conflicts of Interest: The author declares no conflict of interest.

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