



Editorial

Editorial for the Special Issue “Reviews and Advances in Materials Processing”

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In the area of Materials Science and Engineering, the tetrahedron comprising of processing, microstructure, properties and performance as four vertex corners is always key to develop new materials and to convert them to a useful shape for end application with the best properties possible. As can be envisaged, processing is an integral part of this tetrahedron and the proper development and usage of processing for a given end goal is a must to take the product efficiently to the consumer. The processing of the materials comprises of primary processing techniques and secondary processing techniques. Primary processing of materials can be broadly but not limited to classified into four sub-categories irrespective of type of materials. These include: (a) liquid-phase processing, (b) solid-phase processing, (c) two phase processing, and (d) vapor phase processing. Each of these subcategories have different types depending on a number of governing factors. Similarly, the secondary processing of materials is also very important for giving a desired shape to the materials and these include, for example, (a) forging, (b) rolling, (c) extrusion, (d) drawing, (e) joining and (f) machining. With the advancement in computing tools and the availability of advanced software, modelling and simulation has also almost become an integral part of the processing process so as to realize the best output from them through optimizing the processing/operating parameters.

In view of the intrinsic importance of ‘Materials Processing’, especially for the researchers in the area of materials science and manufacturing, this issue was conceived with a specific aim to bring to the notice of readers the latest advances in various processing types currently used for a wide spectrum of materials. A total of 14 papers were accepted and published in this issue. Among them, 3 are review papers and 11 are research papers targeting different research goals.

Among the three review papers, two of the articles address electro-discharge machining of non-conductive ceramics and a combination of materials written by Volosova et al. [1,2]. The critical issues and the way forward in each case is intelligently described by authors. In the third review paper written by TC Yap [3], the effect of cryogenic cooling on the turning of superalloys, ferrous materials and viscoelastic polymers is described along with the challenges faced by the industry in using cryogenic machining.

Eleven research papers written under this thematic issue address a spectrum of topics related to machining, additive manufacturing, oil processing, nanomaterials processing, metallic processing and polymers processing. The article written by Grigoriev et al. [4] described tool electrode behaviour and wear under discharge pulses during electrical discharge machining. Important insight is provided on electrical erosion wear fundamentals. Another paper written by Melnik et al. [5] presents the research on the parameters of vibroacoustic emission for the development of the monitoring and adaptive control system for electrical discharge machining.

Two of the research papers focussed on the secondary processing (joining) of metal-based materials. Tamadon et al. [6] investigated the influence of WC-based pin tool profile and processing parameters during friction stir welding on the microstructure and properties of AA1100 weld. In the second paper, Tamadon et al. [7] used Bobbin Friction Stir Welding



Citation: Gupta, M. Editorial for the Special Issue “Reviews and Advances in Materials Processing”. *Technologies* **2022**, *10*, 77. <https://doi.org/10.3390/technologies10040077>

Received: 14 June 2022
Accepted: 23 June 2022
Published: 24 June 2022

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and investigated the micro-flow patterns within aluminium weld structure. They used Atomic Force Microscopy as the main tool for characterization.

In the area of processing of non-metallic materials and liquid to be specific, Mazumder et al. [8] presented desulfurization technologies in the context of fuel and fuel cells. They focussed on the efficacy of different types of hydrotalcite absorbents.

Two papers in this issue address the advances in polymer processing. T. Aizawa [9] highlighted the CO₂ assisted polymer compression method to prepare porous polymer materials. These authors provided interesting insight in process development. The paper written by Terekhina et al. [10] presented their work on polymer processing using fused filament fabrication method. Different processing variations were attempted and strength was characterized to understand the effects of these variations. Hartmann et al. [11] highlighted the importance of the design of the additive manufacturing process in the context of industrial adaptability. In their article, they proposed a data-driven geometrical compensation approach.

The paper written by Vasiliev et al. [12] reported a set of computational algorithms to optimize the design and the optical or magneto-optical spectral analysis of 1D magnetic photonic crystals together with a windows software implementation. They also reported the methods and algorithms to obtain absorption coefficient spectral dispersion datasets for new materials.

Related to nanomaterials, two articles are included in the present issue. The article by Liem et al. [13] highlighted the use of eco-friendly microwave synthesis of silver nanoparticles using Mulberry leaves extract and silver nitrate solution. In the second article, Chen et al. [14] presented their work on facile fabrication of macroscopic self-standing Ni or Co-doped MnO₂ architectures targeted for enhancing catalytic activities for propane oxidation.

In a nutshell, the papers included in this issue address various processing challenges faced by researchers and industry for liquid, metallic, polymers, ceramics and nanomaterials processing (both primary and secondary). The methods described and the solution proposed are of current relevance and of significant importance to move forward for better efficiency and productivity. It is certain that readers will gain much useful knowledge from these articles.

To conclude, I would like to thank all the contributors to this issue for publishing their immensely useful work with ‘Technologies’. I also thank reviewers for critically going through these papers and making useful comments. Their selfless contribution is much appreciated. I would also like to thank the administrative staff for processing these articles at their earliest and providing much needed support to authors, reviewers and editors.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

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

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