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Editorial

Metal Matrix Composites—The Way Forward

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The magic of the unification of different categories of materials to develop superior materials (composites) with improved functionality was recognized way back by our forefathers and was utilized very well by mother nature to support the dynamic functionality and requirements of both static and moving living organisms. Metal matrix composites (MMCs) represent one such unification type where the base material is either a metal or metallic alloy and the reinforcement is typically a metal or a ceramic. The development and application of MMCs critically depend on a number of factors. The most important of them are listed below [1–3]:

a. Choice of primary and secondary processing techniques to synthesize MMCs;
b. Choice of metallic matrix and reinforcement. They should be compatible to each other;
c. Factors related to the reinforcement selection such as their type, shape, morphology, content and length scale;
d. Matrix-reinforcement interfacial integrity;
e. Heat treatment.

With the support of over 50 years of research in the area of MMCs, many industries such as transportation (land water and air), infrastructure, electrical, sports, machining, biomedical and space sectors are using MMCs increasingly in either the bulk or coating forms [4,5].

MMCs almost always exhibit a superior combination of certain properties such as strength, elastic modulus, hardness, tribological response and a controlled coefficient of thermal expansion. These properties in isolation or in certain combinations are useful for multiple engineering and biomedical applications, thus paving the way for materials scientists to continue with their work to develop even more superior MMCs. Having indicated this, it is of paramount importance to utilize fundamental metallurgical principles to judiciously unify matrix and reinforcement and to convert them into a final product.

Due to rapid ongoing technological advancements, service conditions are becoming more demanding, almost forcing the materials designers to make conscious efforts to develop materials including MMCs with improved properties. In order to highlight the current research efforts in the area of MMCs, ***Applied Sciences***, has come out with a special thematic issue targeting MMCs exclusively. In the present issue, eight contributions from researchers are included that were accepted after rigorous peer review. The following metallic matrices were investigated:

a. Magnesium-based matrix;
b. Aluminum-based matrix;
c. Iron-based matrix;
d. Copper-based matrix;
e. Sn-Ag-Cu-based matrix;
f. Bronze-Ni-Mn-based matrix.

Note that these metallic matrices are utilized in a wide spectrum of engineering applications and are not restricted to any particular engineering sector. The basic inclination to use these matrices was to develop superior performance materials for:

a. Weight-critical applications to minimize fuel consumption for healthy environments;
b. Enhancing the performance of electronic solders;
c. The development of high-performance tools;
d. Thermal management in electronic applications.

The work presented in this Special Issue highlights the current trends and/or possible solutions that the industry is looking for, for increasing the reliability of their products further.

Overall, this book certainly provides a wonderful combination of high-quality research activities conducted across the world in the area of MMCs. This book is likely to be very useful for students and both young and experienced researchers in both academia and industry.

Last but not least, I would like to thank all the authors for their excellent contributions to this issue, to the reviewers for making very thoughtful comments and to the ***Applied Sciences*** editorial staff for publishing these articles at the earliest convenience.

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