Editorial

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Biographical notes: Ajit Behera is working as an Assistant Professor in the Department of Metallurgical and Materials at National Institute of Technology, Rourkela. He has completed his PhD from the IIT, Kharagpur, in 2016. He obtained National 'Yuva Rattan Award' in 2020, 'C.V. Raman Award' in 2019 and 'Young Faculty Award' in 2017. He has published more than 85 publication including book, book chapter and journals. More than six sponsored project has been finished in his advanced materials laboratories. Currently, he is involved with many reputed advanced materials related organisations throughout the world. More than ten PhD students are from his institute/outside the institute and four foreign exchange students are working with different project with him.

Ram Sajeevan Maurya is working as an Assistant Professor in the Department of Metallurgical and Materials Engineering in IIT Indore. He has completed his postdoctoral research in the IIT, Chennai, and PhD in IIT Kharagpur, India. His research areas are bulk metallic glass, oxide dispersion strengthened alloys, high entropy alloys, materials synthesis by powder technology route.

Arpan Kumar Nayak is working as an Assistant Professor in the VIT Vellore. He has completed his postdoctoral research in the Hanyang University and PhD in IIT Kharagpur. He is working as editorial board in two journals, *Nanoscale Reports* and *Journal of Applied Physics and Engineering*.

Subhasisa Nath started working as a Research Associate at the Centre for Manufacturing and Materials Engineering at Coventry University in March 2017. He has been associated in the field of laser material processing and plasma material processing for over seven years. He completed his PhD in the IIT, Kharagpur, India, in 2015. He then joined as a researcher at the University of Chester, UK and worked there over a year. His ongoing research involvements are related to laser surface engineering and laser-based micro and nano-manufacturing techniques. His interest lies in extracting material information at atomic level using X-ray diffraction and electron microscopy.

Emerging materials technologies are primarily dependent on materials processing and their behaviour. Various techniques in materials processing can improve the traditional application limit. This special issue theme is based on the scenario of the current materials. This aims to inform industrialists and researchers from different organisations concerned with the processing of new materials, characterisation of that advanced materials with new technologies that can yields new products. Similar to standard 3D printing, additive manufacturing (AM) enables the creation of custom parts with complex geometries and little waste. Reducing material waste provides cost reduction for high-end products in AM. Among various techniques, the LENS technique has been discussed in this issue with the optimisation properties by the help of artificial neural networks (ANN). Piezoelectricity is exploited in a number of useful applications such as sound production and detection, piezoelectric inkjet printing, high-voltage generation, clock generator in electronics, microbalances, to drive an ultrasonic nozzle and the ultra-fine focus of optical assemblies. Material selection and parametric modelling of piezoelectric energy harvesting materials is essential, which has been discussed here. Graphene is a carbon-based non-material, it holds many promise for advanced applications such as anti-corrosion coatings and paints, ultra-fast electronics, ultra-sensitive sensors, flexible displays, efficient solar panels, faster DNA sequencing, drug delivery, and more. Graphene proved to be stronger than steel but extremely flexible and electrons could pass through it at high speeds. It is not easy to produce graphene in high grades with decent quality. Considering that graphene is non-toxic and different from hazardous materials such as carbon, a small amount is expected to be produced and used, which has proven safe to manufacture. Graphene plays an important role in improving the functional property of structural materials such as coatings and reinforced composites. Smart materials at the nanoscale are the focus point in today's age. Among all physical deposition processes, the magnetron sputtering technique provides a better dense smart product, for example, a NiTi thin film. Microalloying is a process to enhance the properties of materials. Microalloyed steel is a type of alloy steel that contains small amounts of alloying elements (0.05% to 0.15%), including niobium, vanadium, titanium, molybdenum, zirconium, boron, and rare earth metals. They are used to refine the microstructure of the grain or facilitate precipitation hardening. Hot rolled high carbon Nb microalloyed steel plate has been discussed here. The sonotrode is a tool in ultrasonic welder to improve the volumetric properties. The weld component that comes into direct contact and supplies the energy to the metallic materials to be welded and the effect of

the sonotrode during ultrasonic welding has been discussed here. Biochar is an interesting material in advanced materials functional application. Biochar is produced when plant matter (leaves, trunks and roots), manure, or other organic material is heated in an oxygen-free or low-oxygen environment. Carbon that organic matter had previously absorbed through photosynthesis is thus captured in solid form; the resulting biochar can take the form of sticks, granules or powder. When biochar is inserted into soil and other media, effective removal is a focus of current concern. The removal of copper (II) from aqueous media on biochar is shown here. Tool steels are a family of carbon and alloy steels that have different characteristics such as hardness, wear resistance, toughness, and resistance to softening at elevated temperatures. Analytical, numerical and experimental failure analysis of a broken SA564 stainless steel and AISI D2, AISI P20 tool steel has been provided here. The world is looking behind the use of fly ash which is known as the highest percentage of waste in thermal and power plants. High percentage of fly ash can be utilised by the sintering process. Here, the aggregation of sintered fly ash in pervious concrete has been discussed.