Preface for Thematic Section: Sustainable Iron and Steelmaking

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Technology according to the Cambridge dictionary is defined as ‘the study and knowledge of the practical, especially industrial, use of scientific discoveries’ [1]. In terms of the energy used in 2018, the industrial sector used approximately 55% of the global energy, and the basic metals industry accounted for 12%, which indicates a great need for the metals industry to minimize the usage and wastes of this valuable entity [2]. With the global environmental, economical, and resourcing issues facing the metals and materials community, this definition of technology and its implementation requires a prerequisite of the technology to be sustainable for the industry. According to recent estimates [3], more than 30 billion tons of fossil-fuel-related CO₂ were emitted in 2018 resulting in the highest level of CO₂ concentrations in the atmosphere to date. Slags that are produced from the iron and steelmaking industry amount to more than 400 MT/annum, and costs have significantly risen for treatment and utilization of a few of the steelmaking slags [4, 5]. In the nonferrous aluminum smelting industry, more than 400 KT/annum of the spent pot lining and other process wastes are unavoidable, and recycling of these materials has become an essential condition for continued operations [6]. These critical issues along with diminishing high-quality materials reserves have made it a priority to ensure sustainable technology development in the metals and materials industry.

With the above facts in mind, this thematic section on sustainable iron and steelmaking aims to provide an overview of the sustainability issues specific to the steel industry that is of interest to academics and industry professionals alike.

In this collection of articles, recent progress on steelmaking process coproducts, fundamentals in the selective removal of high-value-added nonferrous elements, and future ironmaking technology progresses are discussed.

These articles contain not only fundamentals of thermodynamics and kinetics, but also industrial-scale applications of reutilization, which should provide insights into the future sustainability of the iron and steelmaking industry.

References

1. Cambridge Dictionary <https://dictionary.cambridge.org/dictionary/english/technology>. Accessed 8 May 8 2019
2. U.S. Energy Information Administration. <https://www.eia.gov/todayinenergy/detail.php?id=38392>. Accessed 8 May 8 2019
3. Harvey C (2018) CO₂ emissions reached an all-time high in 2018, E&E News, Scientific American. <https://www.scientificamerican.com/article/co2-emissions-reached-an-all-time-high-in-2018/>. Accessed 8 May 8 2019
4. World Steel Association (2019) Fact sheet—Steel industry coproducts. https://www.worldsteel.org/en/dam/jcr:1b916a6d-06fd-4e84-b35d-c1d911d18df4/Fact_By-products_2018.pdf. Accessed 8 May 8 2019
5. Wang Z, Sohn I (2019) A review on reclamation and reutilization of ironmaking and steelmaking slags. *J. Sustain Metall* 5:127–140
6. <https://primary.world-aluminium.org/aluminium-facts/emissions-waste/>. Accessed 8 May 8 2019

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