Journal of Research and Reports on Metals
Extended Abstract
2020
Vol. 4, Iss. 1

Manuscripts submission Open for Metallurgy: Research and Reports on Metals

Samuel Frimpong
Missouri University of Science and Technology, USA

Metallurgy used to be an art rather than science until mid of nineteenth century during which period large metallurgical plants were developed (based on empirical relations, trial and error, intuition, etc.) and operated successfully. Since more than one and a half centuries, metallurgy has emerged as a science and more predictive. Therefore, in metallurgy field, often the problems are posed in terms of real problem which plants are facing during operation like less productivity, environmental problems, etc. As these processes were evolved not based on well-established scientific criteria, therefore, to understand these processes and to address the problem, one has to scale down the industrial process (quite opposed to scaling up which is carried out more in aerospace/mechanical/chemical engineering discipline where the science is well developed and plant came up after studying the laboratory scale and pilot models) to laboratory scale. However, the principle involved in either scaling up or scaling down is the same. An excellent example of improving the process by scaling down is the study of iron-making blast furnace. Blast furnaces used to produce 50 tons a year hot metal in late eighteenth century, and in the beginning of 21st century, its capacity has improved to more than 5.5 million tons/year. This is possible only by studying the blast furnace process in various parts to understand the science behind all the processes which are occurring in a blast furnace. To illustrate this, an example is given in section 3.1.6 on raceway size prediction as it affects the aerodynamics of the blast furnace and thus the heat and mass transfer and hence the productivity.

Metallurgy is above all the science of alloying. From the big three: iron, copper and aluminium, and perhaps twenty other elements which are also household names, it is possible to generate more or less the complete range of alloys in common use. Of course, the interaction between pairs, or larger numbers, of elements is described, as a function of temperature and compositions, by a phase diagram. The understanding of these diagrams is as mother's milk to a metallurgist, and their importance cannot be questioned. Phase diagrams do exist in polymer science, but their significance is not pre-eminent, and there are many involved with polymeric materials who can ply their trade without ever having to encounter one. Why the difference?

In the first instance, the number of polymers which can be envisaged and synthesised is semi-infinite. There is a huge number of ways in which carbon, oxygen, nitrogen and hydrogen atoms can be put together to make different chains or networks. So it could be argued that instead of trying to mix different types of chains to make materials with different properties, the polymer chemist merely dreams up and synthesises another molecule. There may be something in this view; however the central reason why polymer alloys are not centre stage is that they are reluctant to form solutions or compounds with each other. They simply do not alloy very well.

The science that offers with tactics utilized in extracting metals from their ores, purifying and alloying metals and growing useful objects from metals is called metallurgy. The basic metallurgical processes used for the extraction of metals from their ores are Grinding, Concentration, Floatation Tank, Rotation, Smelting and Refining. Metallurgy is subdivided by characteristics into ferrous metallurgy also known as black metallurgy and non-ferrous metallurgy also known as coloured metallurgy. The manufacturing of ferrous metals accounts for more than ninety% of metal manufacturing globally.