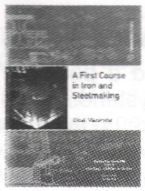
## Book Review



**A First Course in Iron and Steelmaking**
**– Dipak Majumdar,**
Published by Prentice Hall of India, 396 Pages, Price: Rs. 800

In the present era where everybody is going to materials ignoring the classical metallurgy like extractive metallurgy, this book is a real boon. There has been really dearth of good text books in the area of iron and steelmaking, especially for the book that deals the subject in a quantitative and interesting manner. In the present day of steelmaking where the subject is well developed, further development hinges on the quantitative analysis of the process that can lead to process variants even with marginal improvements in some cases. Therefore, the budding metallurgist has to be trained in a way that instils them with a mind of quantitative approach towards the process. The fundamental aspects involved are quantitative thermodynamics, kinetics, transport phenomena, heat and material balance, transport equations involving heat, mass, and momentum equations in microscopic scale. The book has compiled all the above mentioned aspects in the same platform and the ironmaking and steelmaking has been narrated in a quantitative way using these tools. The book is the outcome of the authors dedicated efforts towards teaching, research and industrial consultancy over the last few decades. The book focuses more on principles rather on the practices, which helps a young mind understand and realize the process from a fundamental basis and subsequently understanding the practice will be easier.

The first chapter briefly discusses about the evolution of iron and steelmaking from the inception at bloomery iron making to the most recent state of the art alternative green steelmaking with the constraints of raw material availability and more stringent environmental norms.

Chapter two discusses the basic science bases that are required to realize the iron and steelmaking processes like thermodynamics that quantifies parameters for a feasible reaction, chemical kinetics that establish the rate expressions to quantify productivity, transport phenomena to quantify mass and heat flux at heterogeneous interface, to assist dimensional analysis, and fluid flow to quantify mixing in the vessel.

Chapter three presents the essentials of ironmaking process covering almost all the aspects of ironmaking. Discussion has been brief and to the point keeping scope for self learning through reference books. The chapter discusses the layout of modern integrated steel plant, construction of blast furnace, various temperature and reaction zones, burden preparation, and its distribution, thermodynamics and kinetics of iron ore reduction, blast furnace accessories, efficiency, productivity, blast furnace refractories, slag, and pretreatment of hotmetal. The chapter also discusses alternative routes of ironmaking to the scope of the book.

Chapter four discusses in details the steady state heat and material balance of the blast furnace, the aspects which is absent in almost all the text book published earlier except the book by Peacy and Davenport, which is out of print today. The presentation imprints the author's indigenous style of teaching the course over decades, with several solved problems. I longed for a book containing such a chapter that equips the students to the art of quantifying the process in a handy and reasonable way. The RIST diagram discussed in this chapter is useful to estimate the fuel rate, exit gas composition, blast rate based on heat and material balance.

Chapter five discusses the thermodynamics and kinetics of oxidation of various impurities of hotmetal, lime dissolution, evolution of impurity and slag during primary steel making. Various hybrid oxygen steelmaking processes, advanced trends in steel making, automation towards reduction in specific energy consumption are discussed. Chapter six presents the various modern units of secondary steel making towards producing clean steel with stringent chemical specifications. Modern EAF are also discussed to a reasonable extent. Finally the chapter also includes the advances of refractories and its treatment towards enhanced refractory life.

Chapter seven touches on the fundamentals of solidification namely heat transfer, segregation, casting defects with emphasis on continuous casting and advanced strip casting. Chapter eight touches on the Indian scenario on iron and steel making and its poor performance against advanced countries and challenges. It also touches on the current scenario of steel education and research in the country.

This is a complete book that encompasses almost all the necessary details that is required for a budding metallurgist. The book provides quantitative approach towards understanding iron and steel making and will be useful both the faculty and students. I congratulate Prof. Dipak Majumdar, who was one of my inspiring teachers at IIT Kanpur, for writing such a book.

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