Editor's Note

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Introduction

Understanding the basic fundamental principles and science of Materials and technologies is of utmost importance in developing and improving their physical properties for the exploitation for practical applications. It is of paramount importance that scientists and engineering personnel have access to a comprehensive source for the development of modern society in terms of infrastructural developments: including housing and highway construction, machinery building, consumer goods, electronics, information and communications industries, medical device industries, energy production and materials, and renewable materials. There are multitudes of development and transformation stages and modification processes which can be applied to materials in order to modify them from their basic form to usable states.

For some materials, it may be enough to apply just one or two stages of processing. However, for some other applications, the basic materials may have to be subjected to many stages of modification and transformation processes before these can be used for practical purposes. There are a large variety of processing techniques and methods which have been developed over decades and there are more techniques which are currently experiencing ongoing development to cater for recent developments in areas such as, micro and nanoscale processing as well as processes based on laser and other non-conventional techniques such as EDM and ECM and other surface engineering processes such as CVD, PVD, PACVD, Ion Beam processing etc.

The *Reference Module in Materials Science and Materials Engineering*, has been divided into 14 broad but distinct Sections each covering a number of related techniques for engineering materials, their fundamental principles, properties and their characterization techniques. Some of these Sections cover aspects of major application based categories in traditional and new technology areas. These 14 Section areas are as follows:

1. Fundamental Materials Science
2. Research in Candidate Materials
3. Material Properties and Integrity Characterisation
4. Material Application, Performance and Life Cycle
5. Electronic Materials
6. Biomaterials
7. Composite Materials
8. Metallic Materials

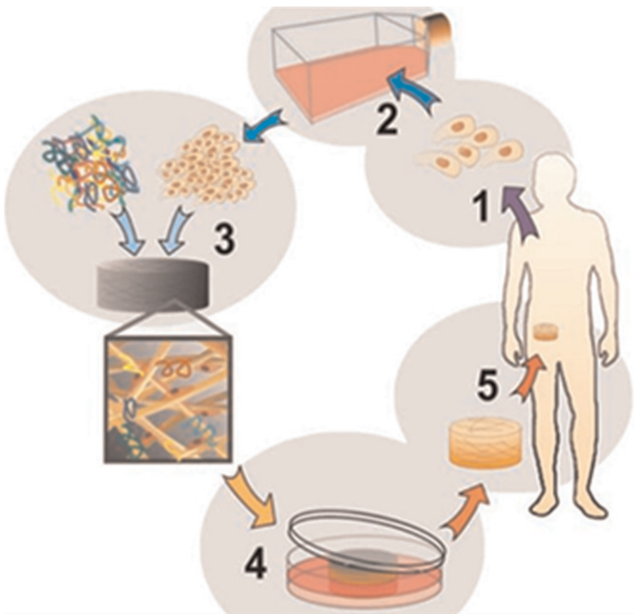

Figure 1 Tissue engineering method of Scheme (1) cells taken from the patient; (2) cell culture; (3) the union scaffold with cells; (4) cell culture in scaffold; (5) implantation in the injured area. (Taken from Feature Article – Biomaterials).

9. Polymeric Materials
10. Nano-Structured Materials
11. Ceramic Materials
12. Materials Processing
13. Energy Materials
14. Renewable and Sustainable Materials.

Each of these 14 Section areas has been coordinated by Editors who are internationally reputable research Professors from all over the world. Each Section area will contain 120 to 200 articles at the launch stage of the Reference Module in Materials Science and Materials Engineering in December 2015. Over the following years, this number of articles will increase for each Section area in an incremental way through the addition of newly commissioned material.

The essential features of this Reference Module are that all the articles will be published online only and that the entire published content will be reviewed periodically and updated, if necessary, to incorporate new developments in the relevant areas.

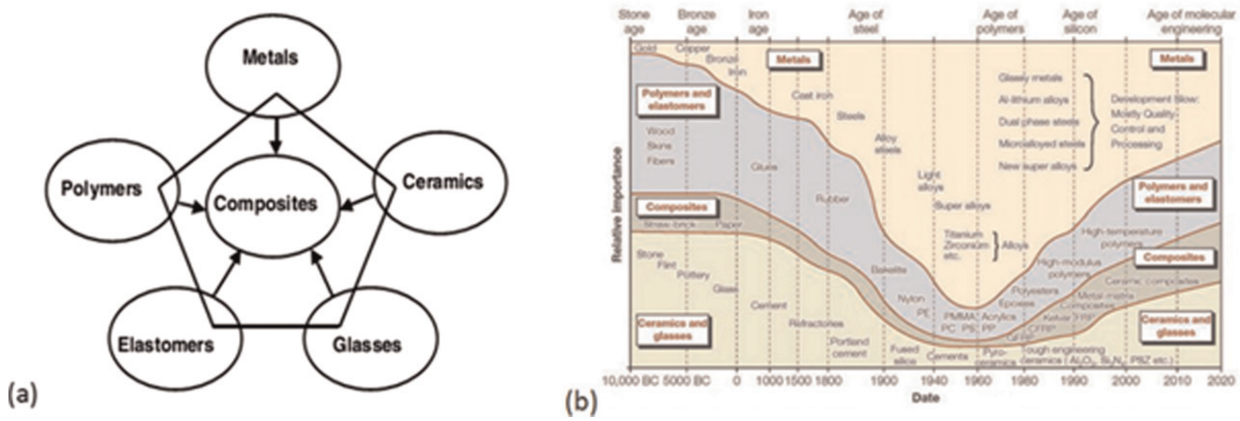

Figure 2 Classes of engineering materials (a) and their relative importance (b). CFRP, carbonfiber, reinforced polymer; FRP, fiber reinforced polymer; GFRP, glass fiber reinforced polymer; PC, polycarbonate; PE, polyethylene; PMMA, poly (methyl methacrylate); PP, polypropylene; PS, polystyrene; PSZ, partially stabilized zirconia, also called as tetragonal zirconia polycrystal (TZP). Reproduced from Ashby, M.F., 2011. Materials Selection in Mechanical Design. Elsevier/Butterworth-Heinemann, UK, p. 646.

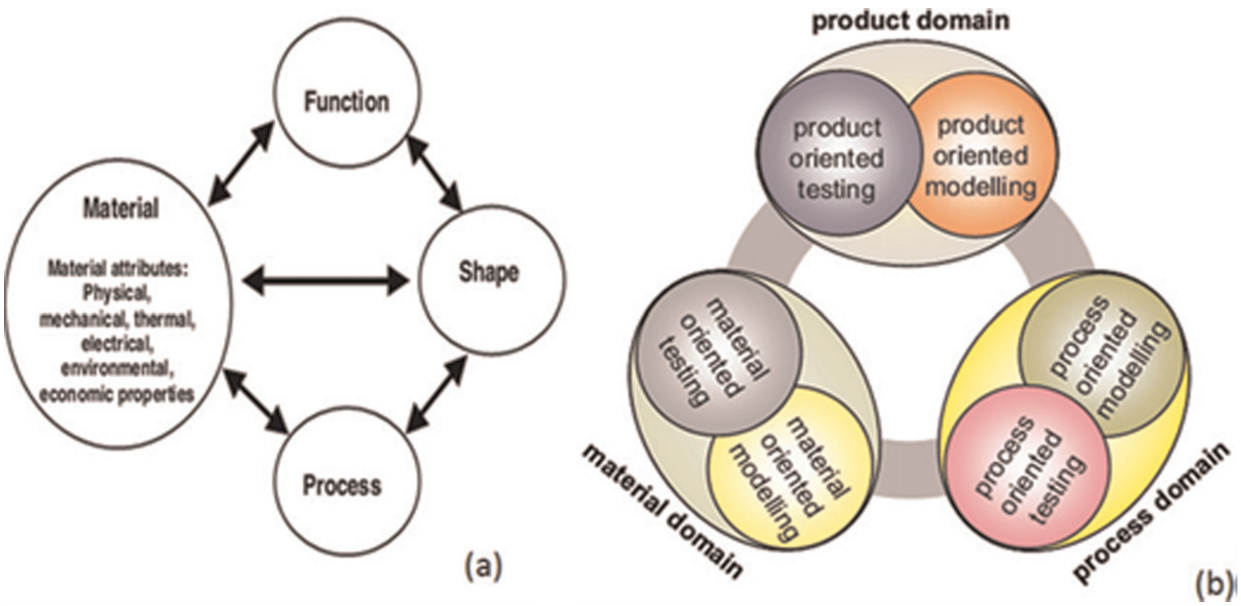

Figure 3 Interactions between function, material, shape, and manufacturing process (a) and contrasting material, process and products domains in terms of modeling and testing (b). Reproduced from Ashby, M.F., 2011. Materials Selection in Mechanical Design. Elsevier/Butterworth-Heinemann, UK, p. 646.; Batalha, G.F., 2012. Design for X – design for excellence. Open Access Library Scientific Journal of the WAMME 6 (12), 116. ISBN 9788635590306.

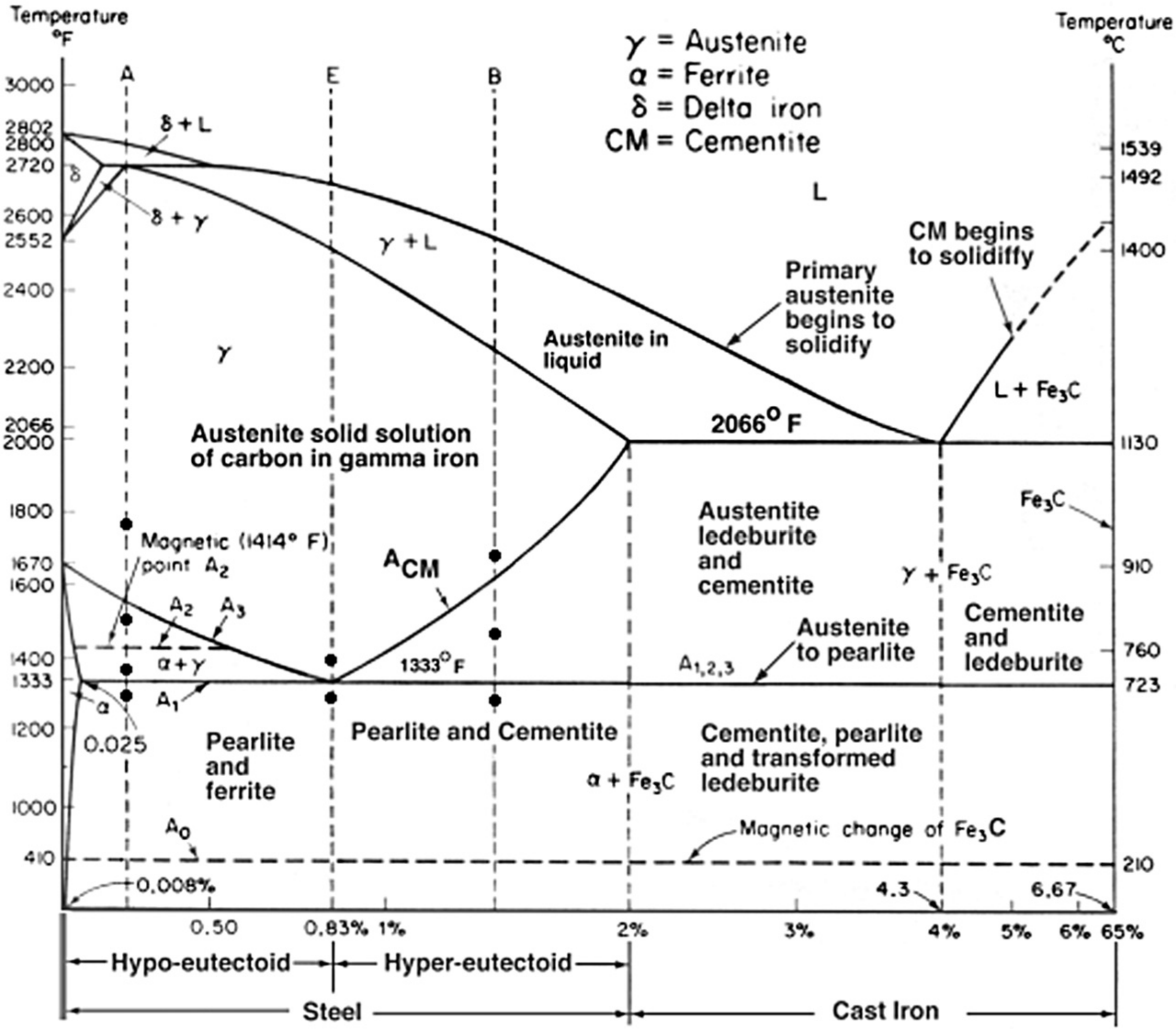

Figure 4 Fe–Fe_3C Phase Diagram (clickable), Materials Science and Metallurgy, 4th ed., Pollack, Prentice-Hall, 1988.

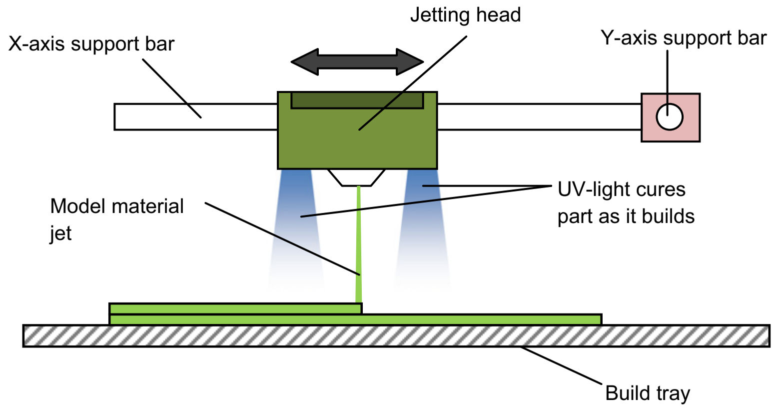

Figure 5 Object polyjet system.

Such updating will be undertaken by the original authors or newly invited authors. In this way this Reference Module will become and remain a major dynamic resource of up to date reference materials new researchers and graduate students as well as established senior researchers and academics.

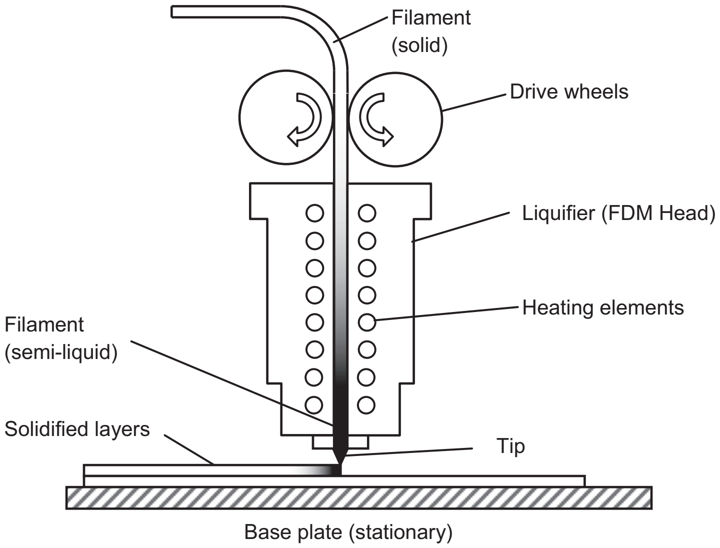

Figure 6 The basic FDM process.

Concluding Remarks

This article introduces the general theme of the *Reference Module in Materials Science and Materials Engineering* and details the main Sections of which it comprises. The key features of this Reference Module are stated briefly and a few illustrative **Figures 1–6** are presented by way of examples only to illustrate the nature and flavor of the contents.