Additive Manufacturing of Low Alloy Steels

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Additive Manufacturing (AM) is finding increasing applications in the aerospace and biomedical industries, where advantages offered by the technology have justified the current higher production costs. As a result, AM processes have been widely developed for materials used in these industries, such as Ti-6Al-4V and other Ti-based alloys and Ni-based alloys including Inconel 625 and 718. Although steel alloys constitute the most extensively used materials in a variety of industrial applications, the application of AM to these materials has been limited to date partly because traditional manufacturing methods have worked efficiently in their fabrication. Low cost relative to other metals and alloys used in AM, easy availability in powder form and non-reactive nature are factors which suggest that this class of materials will find increasing application as materials for AM in the next few years. this paper we examine the applicability of Electron Beam Melting to 16MnCr5, a low alloy steel with case hardening capabilities, which finds use in the automotive industry in the manufacture of drivetrain parts and gears. Process parameters that result in ~99.5% theoretical density have been determined. The resulting microstructures and mechanical properties are presented.

Biography

Dr Sri Lathabai is a Principal Research Scientist with the Metal Industries Program of CSIRO Manufacturing. She received her B Tech in Metallurgy from the Indian Institute of Technology, Madras, India and MS and PhD in Metallurgy and Materials Engineering from Lehigh University, USA. After a post-doctoral fellowship at NIST, USA, she joined CSIRO in 1990. She has conducted research in a wide range of areas including fatigue and fracture of engineering ceramics, wear and erosion, welding and weldability of steels, alloys of Ti, Al, Mg, Zr and Ni-base superalloys, advanced solid state joining methods including friction stir spot welding and friction stir blind riveting. Since 2012, her main research interest has been additive manufacturing by powder bed fusion and directed energy deposition methods. A common theme in all her research is the study of the relationships between process parameters and the resulting microstructures and their influence on structural and functional properties.