A review of powder additive manufacturing processes for metallic biomaterials

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ABSTRACT

Metal additive manufacturing (metal-AM) has undergone a remarkable evolution over the past three decades. It was first used solely as an innovative resource of the prototype. Due to the technology maturity which allows combining various manufacturing processes for the production of a bespoke part that applied complex geometries, additive manufacturing (AM) technology has captured an increasing attention. For the past ten years, it has moved into the mainstream of the industrialised field such as biomedicine. The review covers the recent progress of metal-AM manufacturing technologies, main types of metallic biomaterials, and most common biomedical applications. The direction of the future potential of metal-AM in biomedical research and implementation are further discussed. Selective laser melting (SLM), selective laser sintering (SLS), electron beam melting (EBM), and laser engineered net shaping (LENS) are the most common metal-based additive manufacturing processes employed in the production of the biocompatible parts. The evolution and favourite trend of the metal-AM technologies are highlighted in this review. Additionally, the advancement of metallic biomaterials such as titanium and its alloys, cobalt-based alloys, 316L stainless steel, nickel-titanium, and other metallic biomaterials is also presented since it leads to the transpired of several new studies in the scope of metal-AM in the medical field. The rise of metal-AM in the biomedical industry has also been significant, especially in orthopaedics and dental. The metal-AM is predicted to continue to dominate and further benefit the biomedical industry development.

KEYWORDS: Metal additive manufacturing; Metallic biomaterials; Biomedical applications; Additive manufacturing; Powder metallurgy

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