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Cracking mechanism and suppression method of selective laser melted refractory high-entropy alloy

Hongyuan Wan, Zexin Zhang, Wei Chen
Key Laboratory of Power Beam Processing, AVIC Manufacturing Technology Institute, Beijing, China

Refractory high-entropy alloy (RHEA) has great potential in the field of hypersonic vehicles due to its outstanding high-temperature strength above 1600℃. However, the intrinsic room-temperature brittleness and high cracking susceptibility during laser additive manufacturing severely limit its application. Thus, this paper aims to investigate the crack formation mechanism and suppression method of the selective laser melted (SLM) RHEA. Taking the grain boundary (GB) characteristic as the breaking point, the crack formation mechanism can be clarified by establishing a complete relationship between the crack, residual stress, and GB characteristic. On this basis, an idea of modulating the GB characteristic with the addition of B element is proposed to simultaneously improve the printability and high-temperature mechanical properties of the SLM-RHEA. Our findings will lay a theoretical foundation for the fabrication of large-sized RHEA components via SLM and promote their applications.