

Additive Manufacturing for Crack Repair Applications in Metals: A Case of Titanium (Ti) Alloys

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Abstract

Additive manufacturing (AM) builds intricate parts from 3D CAD model data in successive layers. AM offers several advantages and has become a preferred freeform fabrication, processing, manufacturing, maintenance, and repair technique for metals, thermoplastics, ceramics, and composites. When using laser, it bears several names, which include laser additive manufacturing, laser additive technology, laser metal deposition, laser engineered net shape, direct metal deposition, and laser solid forming. These technologies use a laser beam to locally melt the powder or wire and the substrate that fuse upon solidification. AM is mainly applied in the aerospace and biomedical industries. Titanium (Ti) alloys offer very attractive properties much needed in these industries. This chapter explores AM applications for crack repairs in Ti alloys. Metal cracking industrial challenges, crack detection and repair methods, challenges, and milestones for AM repair of cracks in Ti alloys are also discussed.