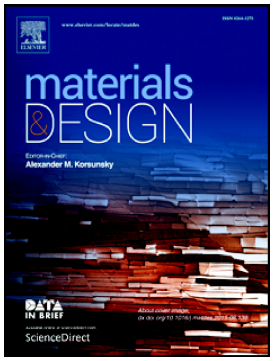

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Microstructure and Physical Performance of Laser-Induction Nanocrystals Modified High-Entropy Alloy Composites on Titanium Alloy

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ABSTRACT: Ultrafine nanocrystals (UNs) modified high-entropy alloy composites (HEACs) were fabricated by laser-melted deposition (LMD) of the yttria partially stabilized ZrO_2 (YPSZ) and the FeCoCrAlCu mixed powders on the aviation turbine blade made of the additive manufacturing (AM) TC17 titanium alloy. Such HEACs exhibited the finer microstructure free of micro-crack under an an action of YPSZ, also relative stable atomic group of UNs owned the short-range order was produced attached to such HEACs matrix. **Formation mechanisms of the $AlCu_2Zr$ UNs, amorphous and the nanoscale icosahedral quasicrystals (I-phase) with five-fold symmetry in HEACs were explored extensively by mean of the high resolution transmission electron microscope (HRTEM)**; also, under the actions of these various phases, such laser-induction HEACs exhibited the better wear performance than that of the FeCoCrAlCu LMD high-entropy alloy. With SiB_2 addition, lots of the one-dimensional nanostructure materials (nanorods) were produced, retained UNs can be easily reunited due to a surface effect, retarding growth of nanorods in a certain extent. This research may provide the essential theoretical and experimental basis to improve the quality of the laser 3D print composites.

Keywords: Nano composites; intermetallics; surface treatments; powder processing; high-entropy alloy composites

1. INTRODUCTION

Current research has demonstrated lots of the desirable characteristics of the quasicrystals, for instance the reasonable/corrosion resistance, high hardness, low friction coefficient and also the unusual optical properties [1-3]. Moreover, in the past decade nanocomposite coatings have