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Additive manufacturing of WC reinforced maraging steel 300 composites by cold spraying and selective laser melting

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Abstract: Till now, additive manufacturing (AM) technologies based on different principles have been widely applied to produce metal matrix composites (MMCs). In this study, AM technologies of cold spraying additive manufacturing (CSAM) and selective laser melting (SLM) were used to manufacture maraging steel 300 (MS300) composite reinforced by WC particles. The results show that the SLM composite possesses a relatively higher densification rate and a lower porosity than that of the CSAM composite. Dry sliding wear test and microhardness measurements were performed to characterize the mechanical properties. The CSAM composite possesses a slightly higher microhardness value than that of the SLM composite. However, the SLM composite shows a significantly lower wear rate than that of the CSAM composite, presenting a stable evolution of the friction coefficient and a worn morphology without obvious scratches. However, these differences in the mechanical properties can be contributed to the distinct evolution features of the WC reinforcement particle during these two AM processes. Through understanding the composite formation mechanisms and the WC evolution, it is possible to provide a guidance for application of the different AM technologies for preparation of MMCs.

Keywords: Cold spraying; selective laser melting; WC; maraging steel 300; microstructure; tribological behavior

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