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Enhancing surface finish consistency by novel ECM process on SLM AM components

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Abstract

Additive manufacturing (AM) is a process where the component is built layer-by-layer using powder or wire precursors. This novel technology offers advantages over conventional subtractive machining in terms of design optimization and weight reduction and enabling the creation of complex internal and external features that are impossible to achieve with conventional subtractive machining. AM component's surface finish is highly dependent on build orientation; thus, the surface finish is vastly is different across the same component. Furthermore, the AM component's surface finish is relatively rougher than those manufactured by subtractive machining. Electrochemical polishing (ECM) is the process of removing the material from a component surface to optimise the finish. In the ECM process the part is placed in ionic solutions and materials is removed by dissolution via a high electric current. In this experiment stainless steel 316 artefacts was made by an SLM Renishaw 400 AM machine, they are then polished by an AM optimised ECM method. The artefact surface was characterised by Alicona G5 focus variation before and after polishing. The impact of the ECM polishing on surface finish is reported. The data processing was carried out Mountains digital surf software and focussed on ISO 25178 standard areal topography parameters. The focus of this study is identifying the Impact of ECM on optimising the relatively AM surface resulting from the AM process.

Keywords: Additive manufacturing, ECM, powder bed fusion, selective laser melting, focus variation.