Chemical etching as a finishing process of Electron Beam Melting (EBM) Parts

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Abstract.
The processes linked to additive manufacturing allow to reduce the industrialization step by eliminating or minimizing the tools conception phase, process development,. . . However, in most cases, the surface condition of the manufactured parts is very bad leading to an additional step, a post-processing. In this work, the studied additive manufacturing process is the electron beam melting and the post processing is chemical etching.

The aim of this paper is to analyze the impact of chemical etching on parts produced by electron beam melting. Given that the surface conditions are poor (Ra between 25 to 35 m), an enhancement of these is asked. A dimensional and surface measurment are realized on a series of conceived parts. This study has the aim of determining if the process is repeatable in an industrial case. Indeed, the analyze of the results will determine if the process is uniform and homogeneous on all the parts and especially identify if the surface condition has improved. Furthermore, a detailed analyze is done to ensure that the machining keeps the small details.

A geometry was defined and several parts were printed. The parts will undergo a dimensional and surface controls. These measures will be realized in the same way before and after the manufacturing process. These parts will be manufactured in the company Safran and machined in Chimiderouil with an average removal of matter of 150 μm. Two different baths will be employed to do the tests, both composed of nitric acid and hydrofluoric acid. The difference between the baths is the concentration of the acids. The agitation parameter will be modified, leading to four conditions of test : bath 1 with or without agitation and the same for the second bath. The improvement of surface quality was also evaluated after each treatment.

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