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Plasma Based Surface Finishing of 3D Printed Metallic Parts

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Since several years, the formation of three-dimensional objects with arbitrary geometry has gained growing interest, especially concerning rapid prototyping or additive manufacturing of different parts for a huge range of applications. Methods for the so-called printing of plastic parts are stereolithography, digital light processing, polyjet modeling or fused deposition modeling using typically digital data from a 3D model generating complex 3D structures.
Furthermore, the printing of metallic geometries arouse great interest due to its feasibility of generating complex parts for e.g. automotive or aerospace industry, especially for rapid realization of prototype parts. Moreover, for changing single damaged parts, e.g. blades in a turbine, the 3D printing of the needed parts are of high interest not least from a financial point of view. Typical methods for generating 3D printed metallic parts are selective laser melting and electron beam melting. In the case of printed metallic parts, the surface roughness is very high. Consequently a polishing process is needed providing the opportunity reducing massively the surface roughness of complex shaped parts, e.g. in preparation for coating deposition.
At this point, the plasma electrolytic polishing process offers the opportunity polishing complex 3D structures highly efficiently in a short time scale. The rough parts are moved into a solution of a specific electrolyte with defined conductivity and temperature biased by a positive voltage in a range of 90 to 400 V. This leads to the formation of a plasma around the part causing plasma chemically induced abrasion of the surface.
In this talk, the concept of treating metallic 3D printed parts by plasma electrolytic processes will be presented including several examples, inter alia from automotive and aerospace industry.

Keywords
plasma electrolytic polishing
additive manufacturing
rapid prototyping