

# Replication of micro-structured surfaces by integrating AM with PIM

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3DIMS, 3D-Printing Integrating Manufacturing System, is a process that couples additive manufacturing (AM) with powder injection moulding (PIM). This process allows to overcome some limitations of the conventional injection moulding process such as: high tooling cost, geometrical constrains and failure to manufacture customized parts. This novel process chain works as follows: a thin wall mould is fabricated with a vat-photopolymerisation AM machine, then the mould is filled with a slurry made of metal or ceramic powders and a binder system, after that the mould is dissolved and the part is debinded and sintered. Due to the numerous steps in the manufacturing chain, there are multiple sources of uncertainties and accumulated errors. This work presents an extensive description of this process chain focusing on the geometrical deviation for each step of the process in order to correct and compensate them at the beginning of the chain. The quality of the replication will be evaluated by investigating the geometrical displacement of micro-features on the surface, using an Olympus Lext confocal microscope. Special attention is paid to micro-structured surfaces due to their ability to give new functions to the final part. An investigation on the feasibility to reproduce a close array of micro-pyramids will be carried out in order to produce a part with optical functionalities. The final aim of this investigation is to evaluate and quantify how each stage of the process chain affects the final part and its micro-structure, to verify the possibility to use the 3DIMS process to reproduce objects with functional surfaces.

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