



Special Issue Reprint

Product/Process Fingerprint in Micro Manufacturing

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The continuous miniaturization of products and the growing complexity of their embedded multifunctionalities necessitates continuous research and development efforts regarding micro components and related micro manufacturing technologies.

Highly miniaturized systems, manufactured using a wide variety of materials, have found application in key technological fields, such as healthcare devices, micro implants, mobility, communications, optics, and micro electromechanical systems.

Innovations required for the high-precision manufacturing of micro components can specifically be achieved through optimizations using post-process (i.e., offline) and in-process (i.e., online) metrology of both process input and output parameters, as well as geometrical features of the produced micro parts. However, it is of critical importance to reduce the metrology and optimization efforts, since process and product quality control can represent a significant portion of the total production time in micro manufacturing.

To solve this fundamental challenge, research efforts have been undertaken in order to define, investigate, implement, and validate the so-called “product/process manufacturing fingerprint” concept.

The “product manufacturing fingerprint” concept refers to those unique dimensional outcomes (e.g., surface topography, form error, critical dimensions, etc.) on the produced component that, if kept under control and within specifications, ensure that the entire micro manufacturing process complies to its specifications.

The “product/process manufacturing fingerprint” is a specific process parameter that can be monitored and controlled, in order to maintain the manufacture of products within the specified tolerances.



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