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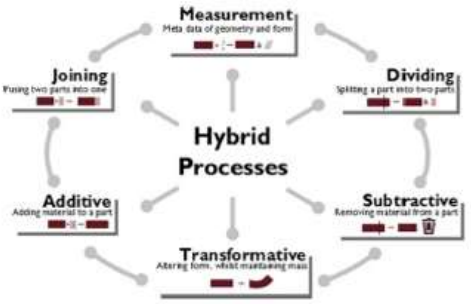
Hybrid platform: sequential combination of two technologies in shaping of ceramic materials

Abstract [1-3]

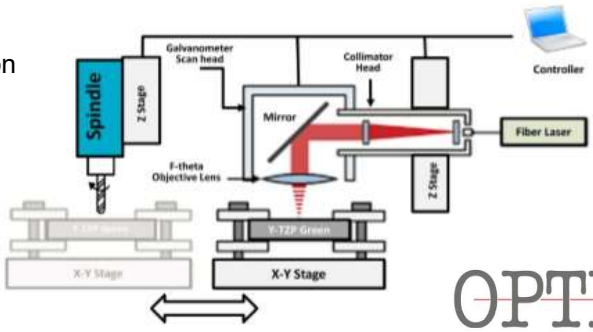
The decentralized manufacture leads to a new local strategy for manufacturing sector. An example is FabLab (an abbreviation of fabrication laboratory) which is a small workshop that contains a number of basic manufacturing equipment, typically 3-axis CNC Mill, vinyl cutter, laser cutter, 3D printer and circuit board production facilities. However, FabLabs house a plurality of machines, they are only enacted one at a time, with manual intervention and change. This requires a competent operator to be present. These shortcomings mean that accessibility for everyday user is inhibited by a lack of manufacturing knowledge. The Hybrid Manufacturing Platform is composed of several technologies that are usually classified in five technology categories and one measurement.



Sub-hybrid Platform [4-6]

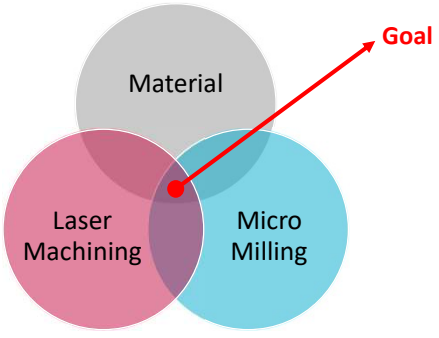
In this case, the Hybrid Platform, which is studied, is the combination of milling and laser machining on the green ceramic.

- Micro-milling
- Nanosecond laser(IPG)
- Femtosecond laser



Devlopment Hybrid Platform

The development of Hybrid Platform is similar whatever the technologies composing the Platform.



Interaction Micro-milling/Material
- Specific cutting energy
- Roughness

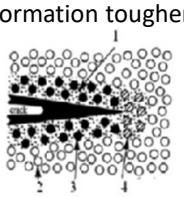
Interaction Laser machining/Material
- Influence of laser parameters
- Ablation threshold experimental

Interaction Micro-milling/Laser machining
- Calibration

Material [7]

- Y-TZP ceramic
- Transformation toughening

CRIBC members of EMRA



1. Processing zone
2. Unstable tetragonal particle
3. Stable monoclinic particle which transformed
4. Tetragonal particle during processing

Bibliography

[1] B. A. Kendrick, V. Dhokia, and S. T. Newman, "Robotics and Computer Integrated Manufacturing Strategies to realize decentralized manufacture through hybrid manufacturing platforms," Robotics and Computer Integrated Manufacturing, pp. 1–11, 2015.
[2] B. Lauwers, F. Klocke, A. Klink, A. E. Tekkaya, R. Neugebauer, and D. Mcintosh, "Hybrid processes in manufacturing," CIRP Annals - Manufacturing Technology, vol. 63, no. 2, pp. 561–583, 2014.
[3] W.-s. Chu, C.-s. Kim, H.-t. Lee, J.-o. Choi, J.-i. Park, J.-H. Song, K.-H. Jang, and S.-H. Ahn, "Hybrid manufacturing in micro/nano scale: A Review," International Journal of Precision Engineering and Manufacturing-Green Technology, vol. 1, no. 1, pp. 75–92, 2014.
[4] S Gross, U Eckert, J Edelmann, and P. M. Putz, "New sequential manufacturing process for micro and finishing machining," 7th HPC 2016 – CIRP Conference on High Performance Cutting New, vol. 46, pp. 559–562, 2016.
[5] W. Chang, X. Luo, J. M. Ritchie, J. Sun, and C. Mack, "Laser deburring process for structured edges on precision moulds," International Journal of Nanomanufacturing, vol. 7, pp. 327–335, 2011.
[6] T. L. Perry, D. Werschmoeller, X. Li, F. E. Pfefferkorn, and N. A. Duffie, "Pulsed laser polishing of micro-milled Ti6Al4V samples," Journal of Manufacturing Processes, vol. 11, no. 2, pp. 74–81, 2009
[7] R. H. J. Hannink, P. M. Kelly, and B. C. Muddle, "Transformation Toughening in Zirconia-Containing Ceramics," Journal of Americal Ceramic Society, vol. 87, no. 190144, pp. 461–487, 2000.

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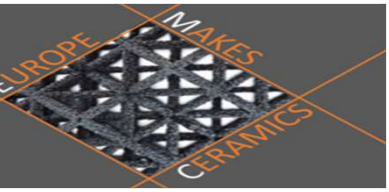

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