4D MICROPRINTING BY DIRECT LASER WRITING

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3D direct laser writing based on two photon polymerization has emerged as a very popular 3D microfabrication method since it can be seen as an extension of 3D printer at the micro and nanoscale. Moreover, this technology has proven its unrivalled ability to sculpt the matters at the nanoscale, as highlighted by major breakthroughs in various fields, for instance in photonics [1] or nanomechanics [2]. On the other hand, 4D printing concept appears in 2013 with the idea to facilitate the assembling of macroscopic objects [3]. Nowadays, the fourth dimension refers not only to the ability for material objects to change form after they are produced, but also to their ability to change function after they are printed. Up to recently, the 4D printing was mainly explored at the macroscopic level, but several working groups have revealed the potential of 4D printing at the microscale. In that context, after a short introduction on 3D DLW principles, I will then discuss about the opportunities offered by micro-4D printing and how to introduce this fourth dimension into the microstructures (**Fig.1**). A special attention will be paid to the difficulties encountered to process functional/adaptive materials and to the role of the processing parameter to program or impact their final properties.

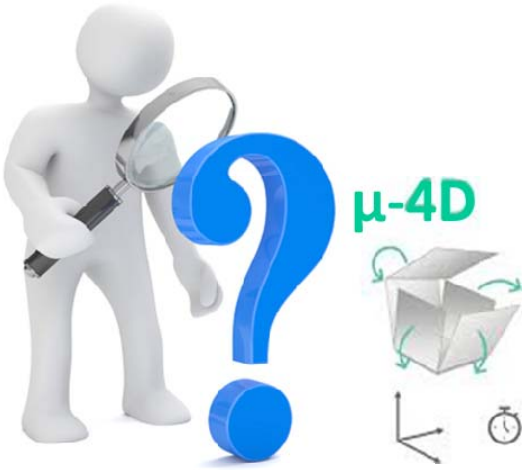

Fig. 1: *Schematic view of µ4D printing adapted from ref. [3]*

[1] Gissibl et al. *Nature Photonics* **2016**, 10, pp. 554–560

[2] Frenzel et al. *Science* **2017**, 358 (6366), pp. 1072-1074

[3] Tibbits *TED2013* “The emergence of 4d printing”