TOWARDS 3D PRINTED STANDARD PROBES FOR FLUORESCENCE MICROSCOPY

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Careful calibration and instrumentation adjustment are essential for high-precision imaging of fluorescent probes. Fast, inexpensive 3D printing of (multicolor) single quantum dots could provide new reference standards for 3D microscopy.

3D printing gains more and more visibility for optical systems [1] and can be useful for fabrication of standard probes for fluorescence microscopy as well. For preliminary tests fluorescent beads of 400nm diameter are introduced into a photopolymer resin prior to printing rods that can be adapted to an innovative device for sample rotation (Fig.1, [2]). Thus, z-stacks of 3D samples can be recorded in different directions, providing an improved effective 3D resolution and possibly additional information about the sample. In the upper part of Figure 2, a viewing angle of 45° calculated from an image stack recorded in 0° direction is shown, whereas in the lower part a z-projection obtained from an image stack recorded under 45° is depicted. A clear enhancement of image quality is observed.

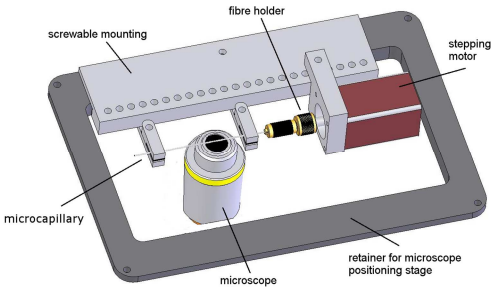

Fig. 1 Microscope module for sample rotation

A further step towards 3D printed standard probes is the introduction of quantum dots to the resin for functionalizing the printing material [3,4]. Figure 3 shows first results for printed quantum dot samples imaged as described above and documents an enhanced resolution when rotating the sample.

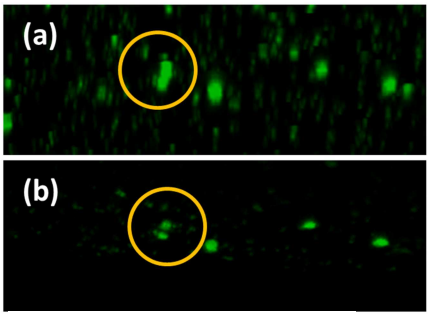

Fig. 2 3D printed fluorescent beads

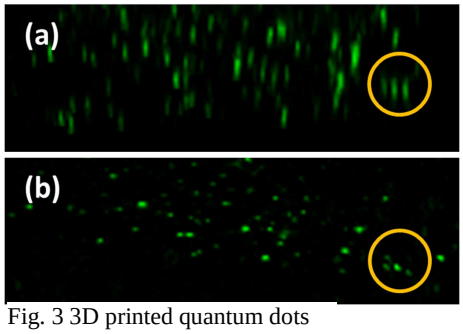

Fig. 3 3D printed quantum dots

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