

# Carbon Quantum Dots Fluorescent Labels Generated by Continuous Laser Fragmentation

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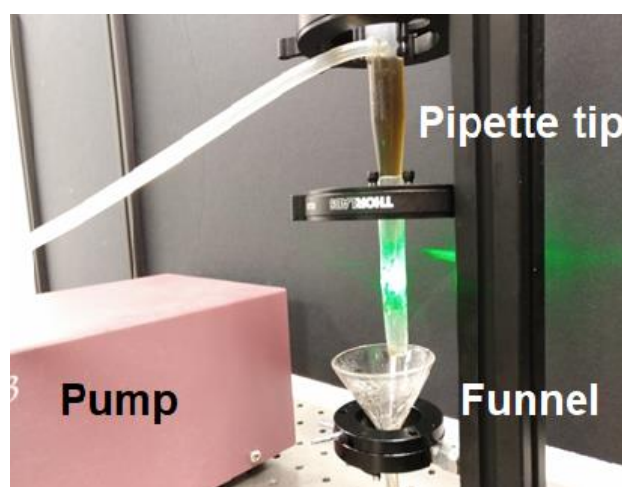
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Carbon quantum dots (CQDs) are an outstanding material being used in applications such as bioimaging, cancer therapy or sensing [1]. To avoid cell damage for in vivo and in vitro imaging application, high purity samples are needed. Laser generation techniques ensure the high purity as no byproducts are needed in the process [2]. In this work it is proved the improvement in the generation efficiency of carbon quantum dots (CQDs) with a pulsed laser by applying for first time with this material a cost effective flow jet configuration in the generation process, Fig. 1. Compared to the most used laser technique, the proposed set up achieves an increase of 15 % in production. Besides, the generated CQDs exhibit an increment in quantum yield of an order of magnitude and its photoluminescence keeps constant for long periods of time even after cell internalization. Fast internalization of less than 10 min without any need of extra processing inside three different cancer and healthy epithelial cells (oral epithelial cells, A-549 lung cancer cells and HT-29 colon cancer cells) is proved, oral epithelial cells in Fig.2 as an example. This features make them an excellent fluorescent label that can be used in any in vitro or in vivo fluorescence imaging application.

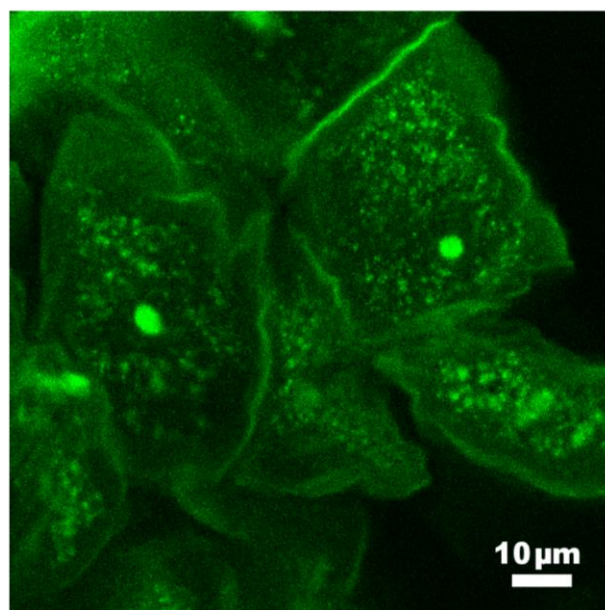
## References

- [1] F. Yuan; S. Li; Z. Fan; X. Meng; L. Fan; S. Yang, *Nano Today*, 11 (2016) 565–586.
- [2] D. Zhang; B. Gökce; S. Barcikowski, *Chem. Rev*, 117 (2017) 3990–4103.

## Figures



**Figure 1:** Flow jet experimental setup for continuous laser fragmentation of a carbon black microparticles suspension.



**Figure 2:** Example of fluorescence image of oral epithelial cells with complete internalization of the generated carbon quantum dots.