以碳量子點作為超解析螢光顯微鏡之閃爍發光團：從量子產率、發射光子數、工作週期、光穩定性到細胞染色之應用性

曾韋龍 ，林伯樵 ，張柏齡

Abstract

We report the preparation of Alexa Fluor 488-like carbon dots (CD) based on the hydrothermal treatment of Rhodamine B and PEG400, followed by purification with HPLC. The purified CDs exhibit the maximum excitation wavelength at 490 nm, maximum emission wavelength at 520 nm, nanosecond lifetime, QY of ~56%, high switching event, and high brightness in PBS solution. These features enable the CDs to be well-suited for the direct stochastic optical reconstruction microscopy (DSTORM) method. Furthermore, the CDs allows high-density localization imaging at a resolution of 20 nm by continuously recording the particle position. The future work will involve the surface modification of the CDs with F-actin and organelle-targeting ligands, the synthesis of Alexa Fluor 532- Alexa Fluor 594-, and Alexa Fluor 647-like CDs, and CD-based super-resolution imaging of F-actin and organelle.

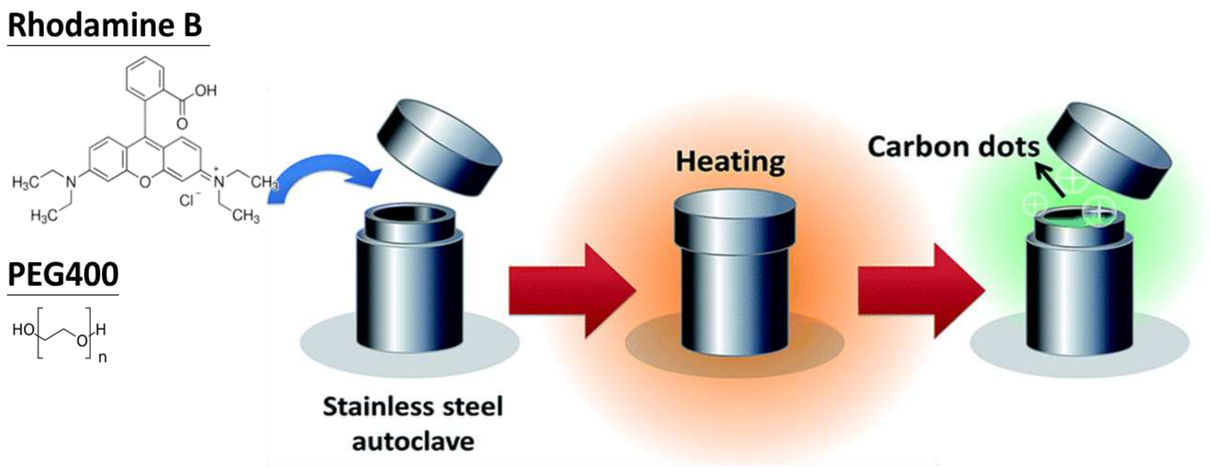


Figure 1. Scheme represents strategy for synthesizing ultrabright Carbon dots

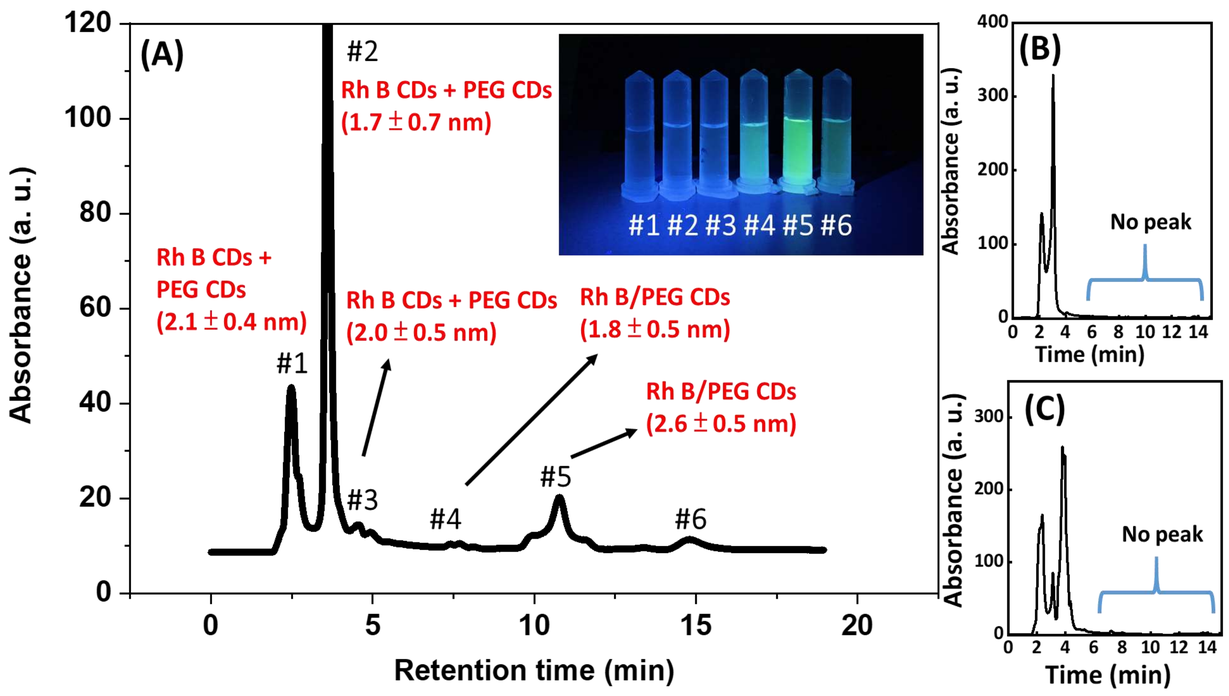


Figure 2. Purification of raw carbon dots by HPLC

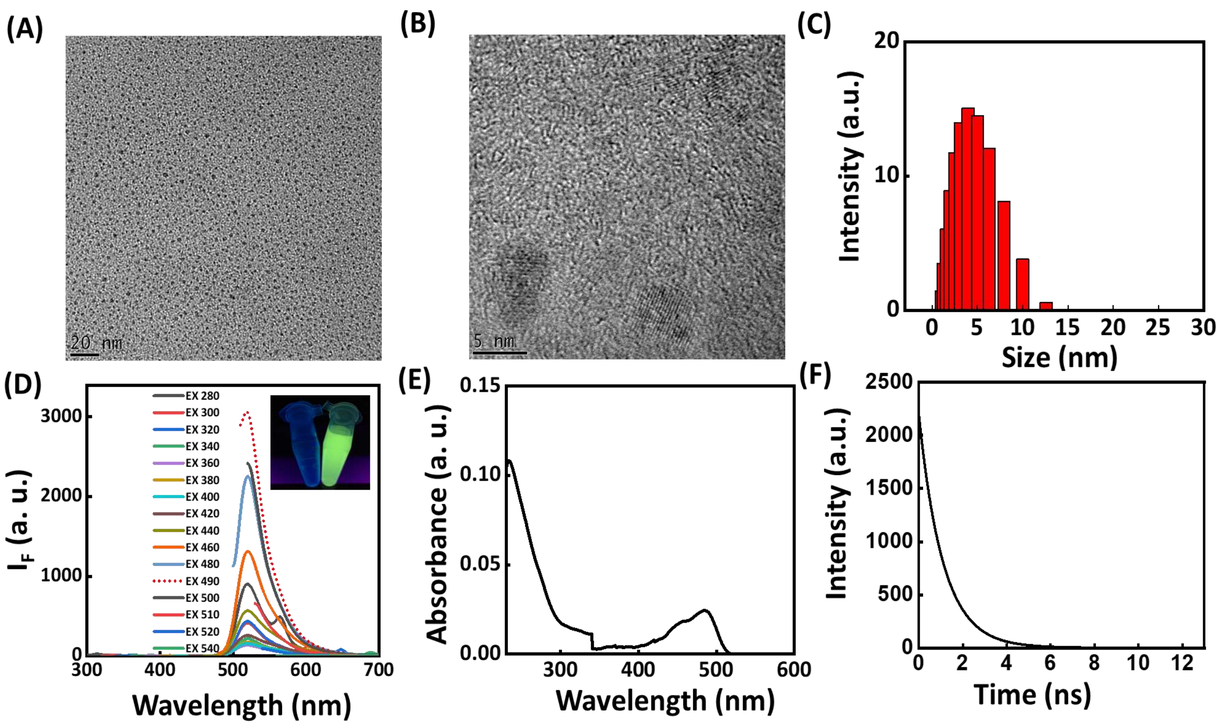


Figure 3. Characterization of purified CDs. (A) TEM Image, (B) High-resolution TEM image, (C) DLS spectrum, (D) excitation-dependent emission spectra, (E) absorption spectrum, and (F) Fluorescence lifetime decay

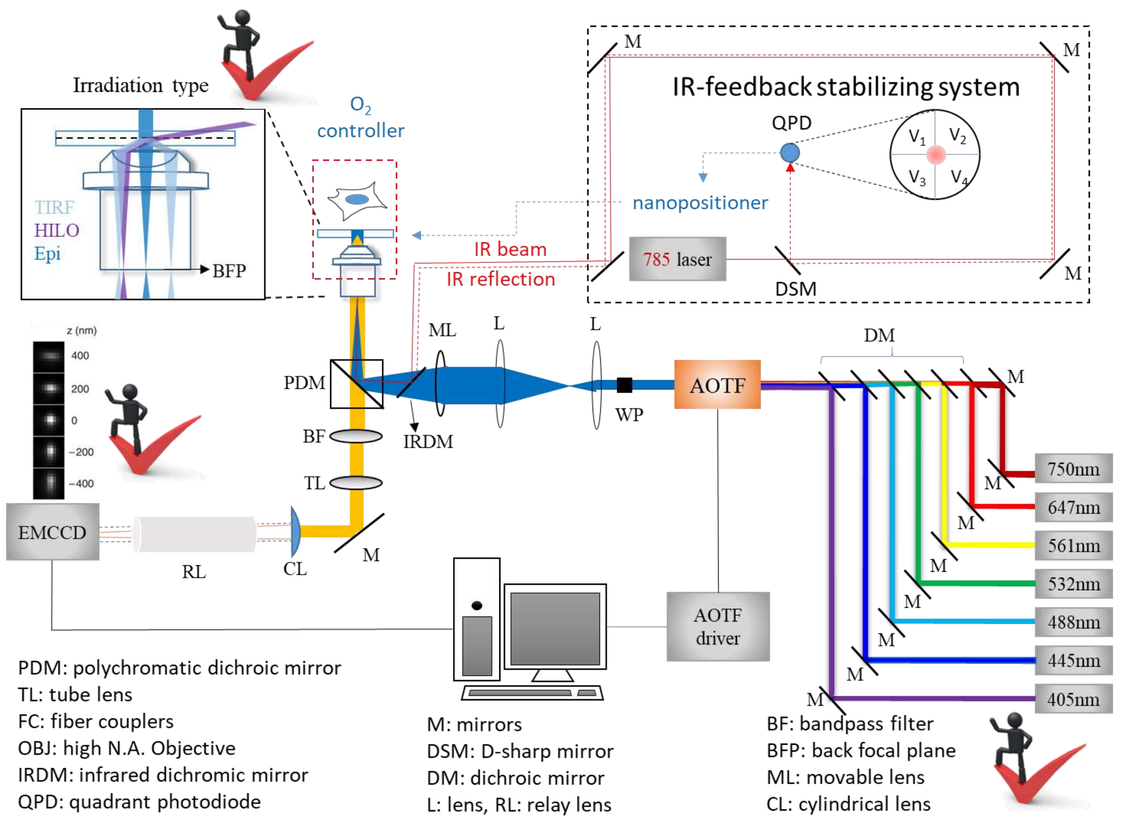


Figure 4. Instrumentation of single molecule localization microscopy

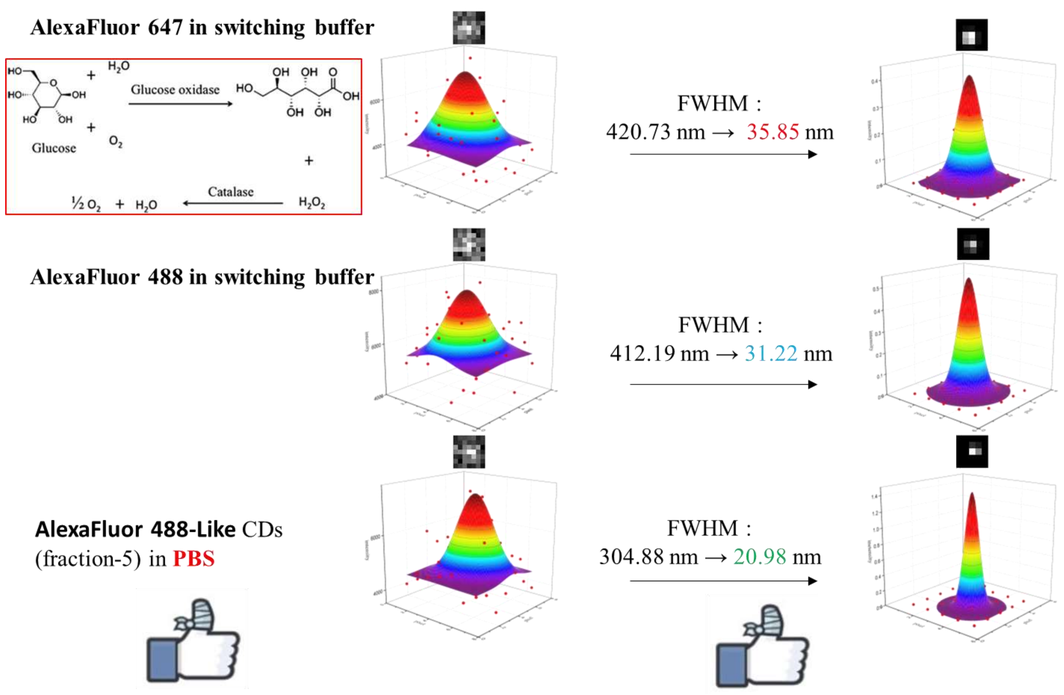


Figure 5. Resolution comparison between (A) Alexa Fluor 488 in switching buffer and (B) Alexa Fluor 488-Like CDs in PBS

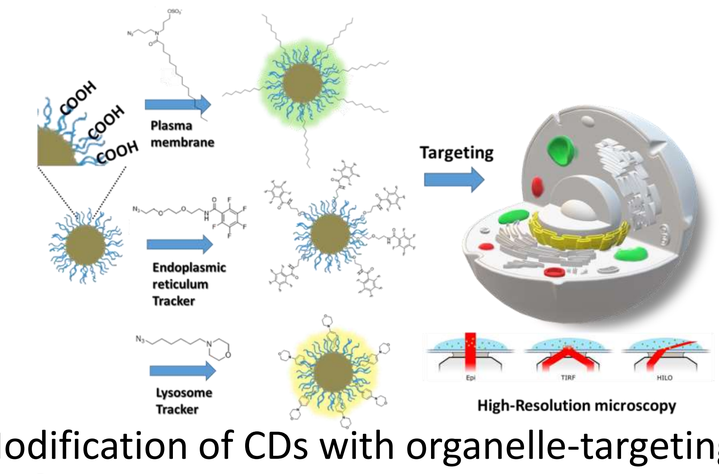
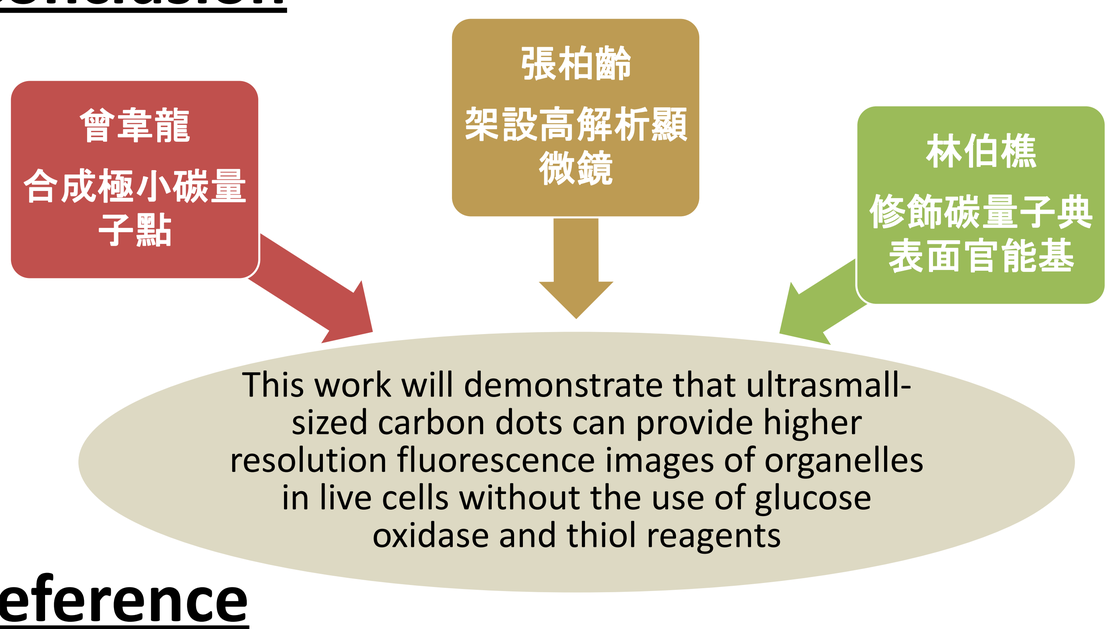


Figure 6. Modification of CDs with organelle-targeting ligands

Conclusion



Reference

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2. Van de Linde, S.; Löschberger, A.; Klein, T.; Heidbreder, M.; Wolter, S.; Heilemann, M.; Sauer, M. Nat. Protoc. 2011, 6, (7), 991-1009.