Supplementary Information

Multifunctional carbon dot for lifetime thermal sensing,

nucleolus imaging and antialgal activity

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Figure S1. Digital photographs of the CDs under visible light and UV light (365 nm) excitation, respectively.



Figure S2. The fluorescence lifetime of CDs.



Figure S3. (a) Zeta potential of CDs at different pH values. (b) DLS size distribution of CDs at different pH values.



Figure S4. DLS size distribution of CDs at different temperatures at pH = 7.2.



Figure S5. Digital photographs of the CDs under UV light (365 nm) excitation at different temperatures.



Figure S6. The confocal laser scanning microscopy (CLSM) images of 293T cell treated with CDs (200 μ g·mL⁻¹) for 30 mins at 4 and 37 °C.



Figure S7. Fluorescence spectra of (a) CDs and (b) RNA/CDs conjugates, respectively, under different excitation wavelengths. (c) The merged graph of Figure S5a and Figure S5b.



Figure S8. Fluorescence spectra of (a) CDs and (b) DNA/CDs conjugates, respectively, under different excitation wavelengths. (c) The merged graph of Figure S6a and Figure S6b.



Figure S9. The time-dependent stability comparison of fluorescence signals of 293T cell labelled by CDs. The photos of fluorescent cell images captured by laser scanning confocal microscopy in 0 min, 10 mins, 15 mins and 20 mins, respectively (200 μ g·mL⁻¹; $\lambda_{ex} = 405$ nm; Emission was collected at 415–550 nm).



Figure S10. The confocal laser scanning microscopy (CLSM) images of *Anabaena sp.* treated with CDs (100 μ g·mL⁻¹) for 30 mins at 4 and 25 °C (λ_{ex} = 405 nm; Emission was collected at 415–550 nm).

| | Just Preparation | After 2 months |
|-----------|------------------|----------------|
| QY | 0.35 | 0.33 |
| Life time | 1.92 ns | 1.91 ns |

Table S1. The QY and fluorescence lifetime of CDs.