

**Effect of synthesis temperature on lemon juice-derived carbon quantum
dots: Valorization into TiO₂ composites for tetracycline removal**

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Table S1. Surface areas, total pore volumes, and average pore sizes of TiO₂ and x-CQDs@TiO₂ composites (x = 160, 200, and 240).

| | Specific surface area (m ² /g) | Total pore volume (cm ³ /g) | Average pore size (nm) |
|---------------------------------|--|---|---------------------------|
| TiO₂ | 93.1 | 0.38 | 15.96 |
| 160-CQDs@TiO₂ | 90.9 | 0.36 | 15.79 |
| 200-CQDs@TiO₂ | 90.7 | 0.35 | 15.39 |
| 240-CQDs@TiO₂ | 88.2 | 0.36 | 15.52 |

Table S2. The relative peak intensity (%) of specific peaks in high-resolution Ti 2p XPS spectra of CQDs@TiO₂ composites (x=160, 200 and 240) and TiO₂.

| Samples | 160-CQDs@TiO ₂ | 200-CQDs@TiO ₂ | 240-CQDs@TiO ₂ | TiO ₂ |
|--|---------------------------|---------------------------|---------------------------|------------------|
| Ti³⁺2p_{3/2} Area% | 4.7 | 5.1 | 5.2 | 3.9 |
| Ti⁴⁺2p_{3/2} Area% | 56.8 | 55.9 | 57.0 | 59.4 |
| Ti³⁺2p_{1/2} Area% | 8.5 | 8.1 | 8.5 | 5.6 |
| Ti⁴⁺2p_{1/2} Area% | 29.9 | 30.8 | 30.2 | 31.1 |

Table S3. Water quality parameters of tap water and river water.

| | pH | Conductivity | Turbidity | DO | DOC |
|--------------------|------|--------------|-----------|-----------|-------------|
| River water | 8.36 | 260.6 μS/cm | 4.15 NTU | 0.61 mg/L | 8.12 mg C/L |
| Tap water | 7.01 | 153.0 μS/cm | 5.36 NTU | 8.08 mg/L | 6.14 mg C/L |

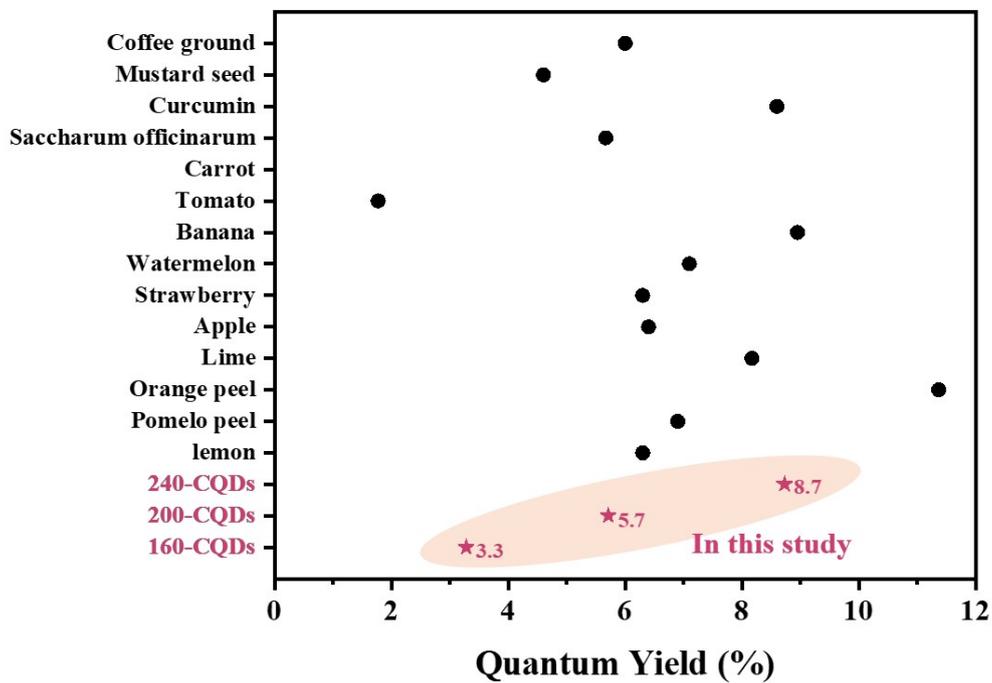


Fig. S1. Quantum yield (%) of natural source-derived CQDs from previous studies and our study.

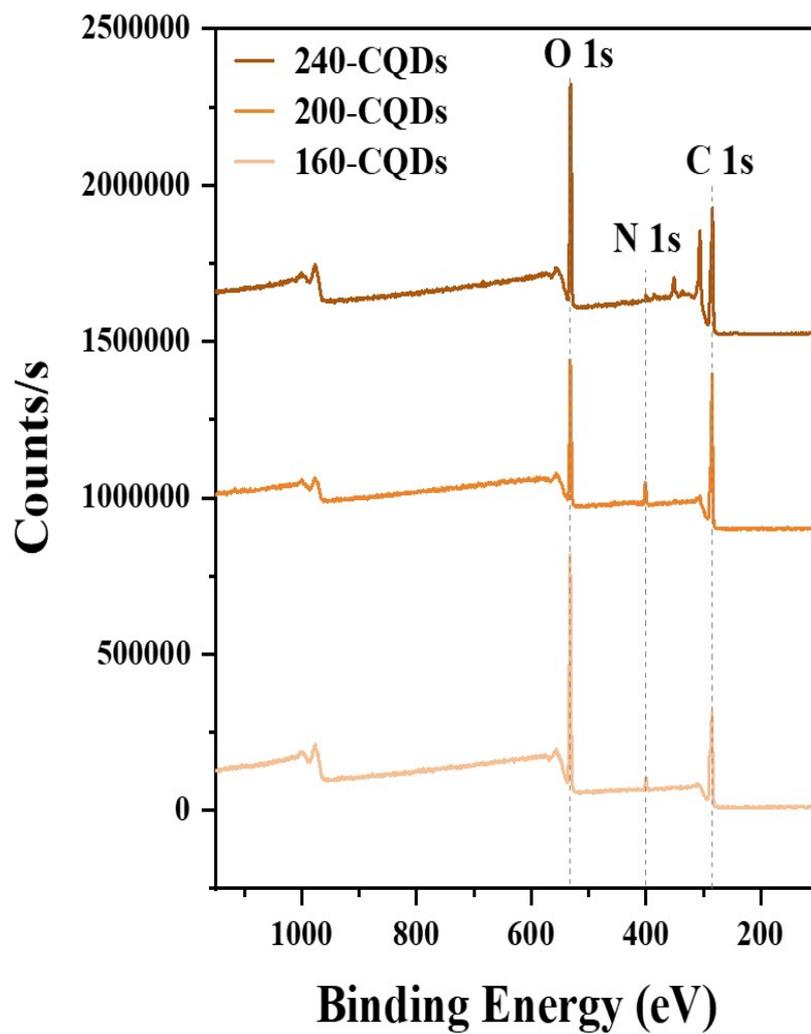


Fig. S2. XPS survey scan spectra of x-CQDs (x = 160, 200, and 240).

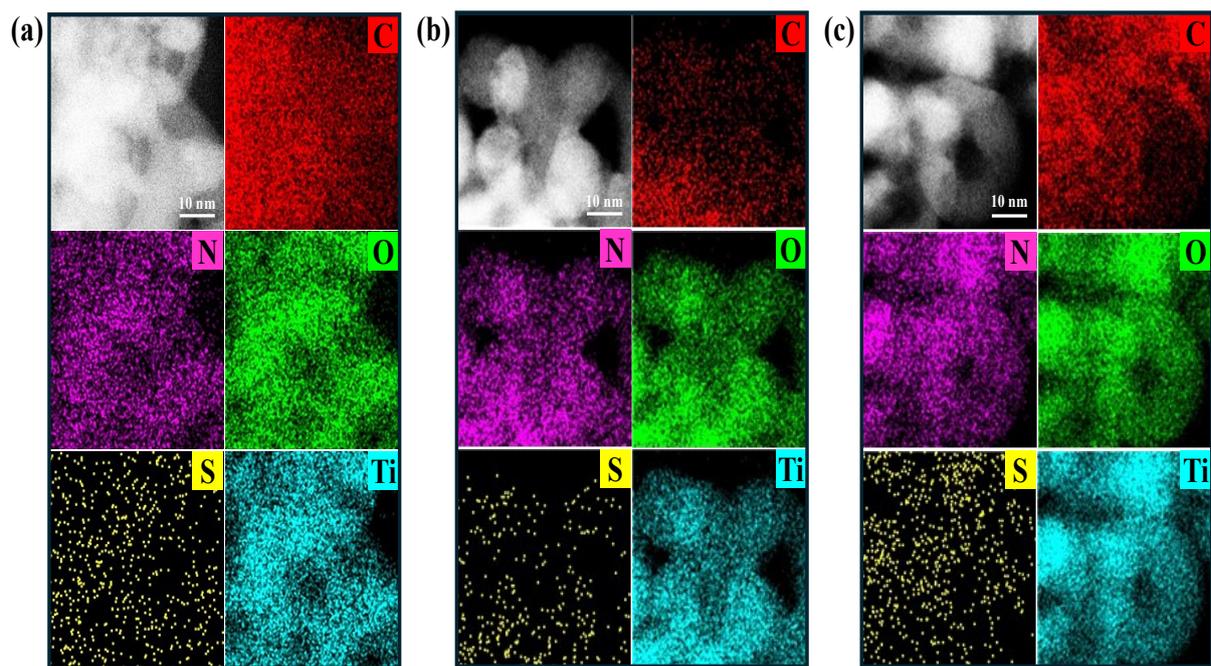


Fig. S3. EDS mapping image of (a)160-CQDs@TiO₂, (b) 200- CQDs@TiO₂, and (c) 240-CQDs@TiO₂.

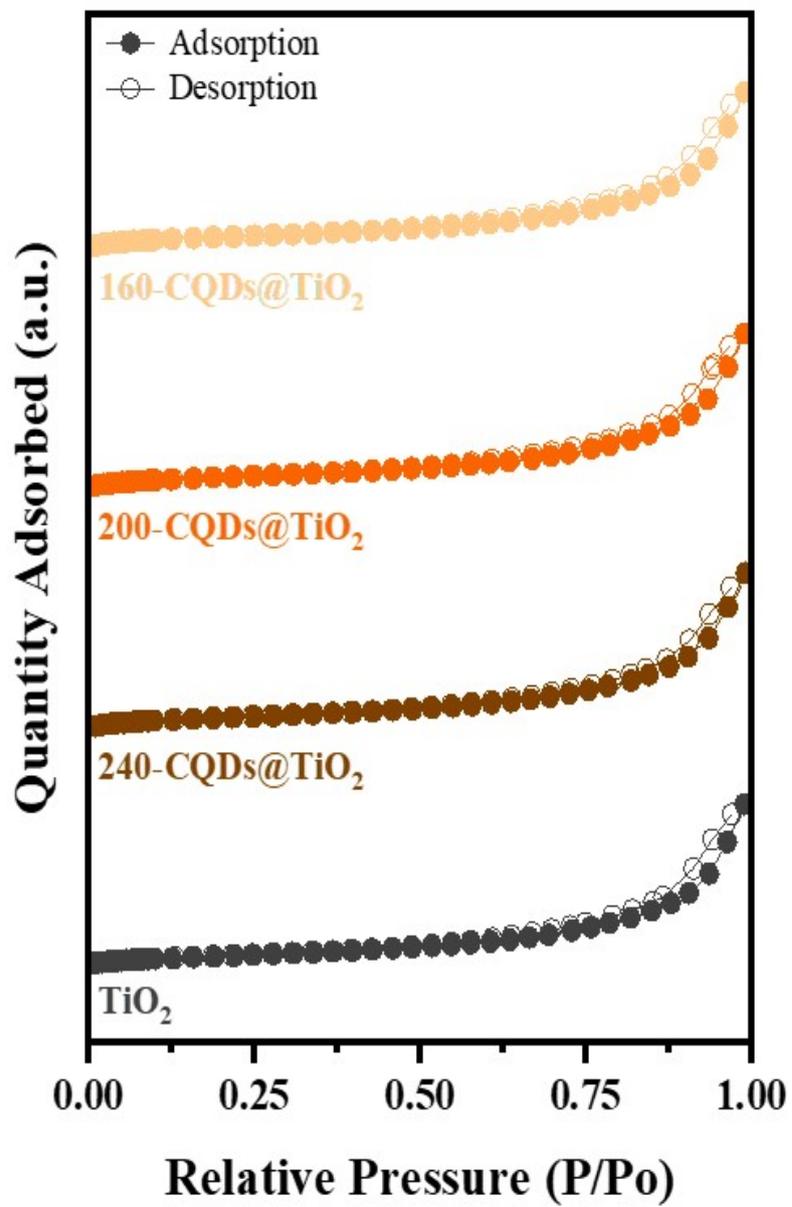


Fig. S4. N₂ adsorption-desorption isotherms of TiO₂ and x-CQDs@TiO₂ composites (x = 160, 200 and 240).

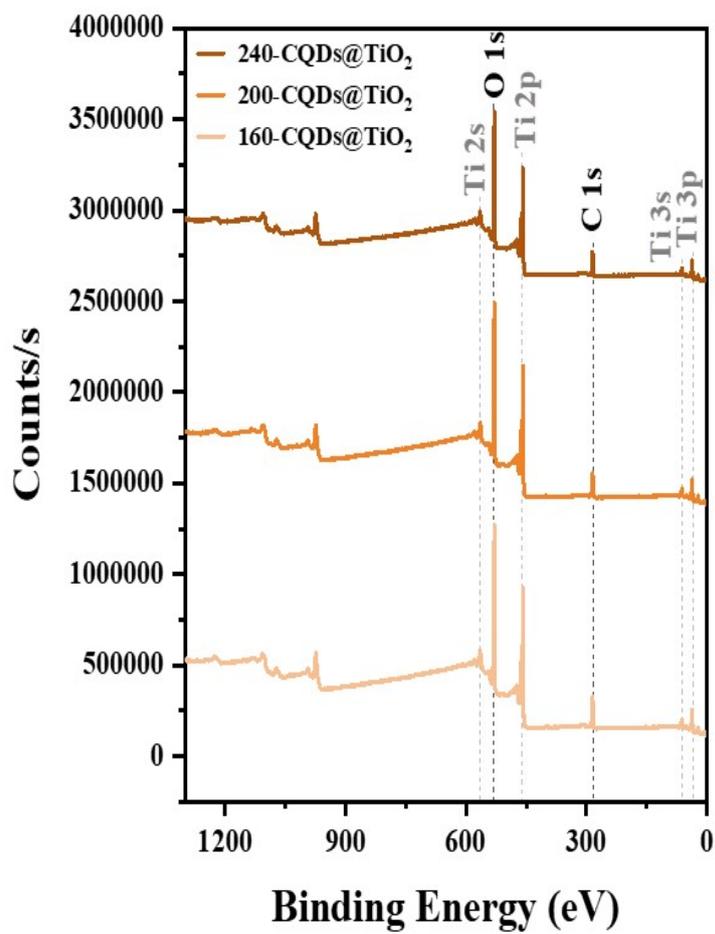


Fig. S5. XPS survey scan spectra of x-CQDs@TiO₂ composites (x=160, 200 and 240).

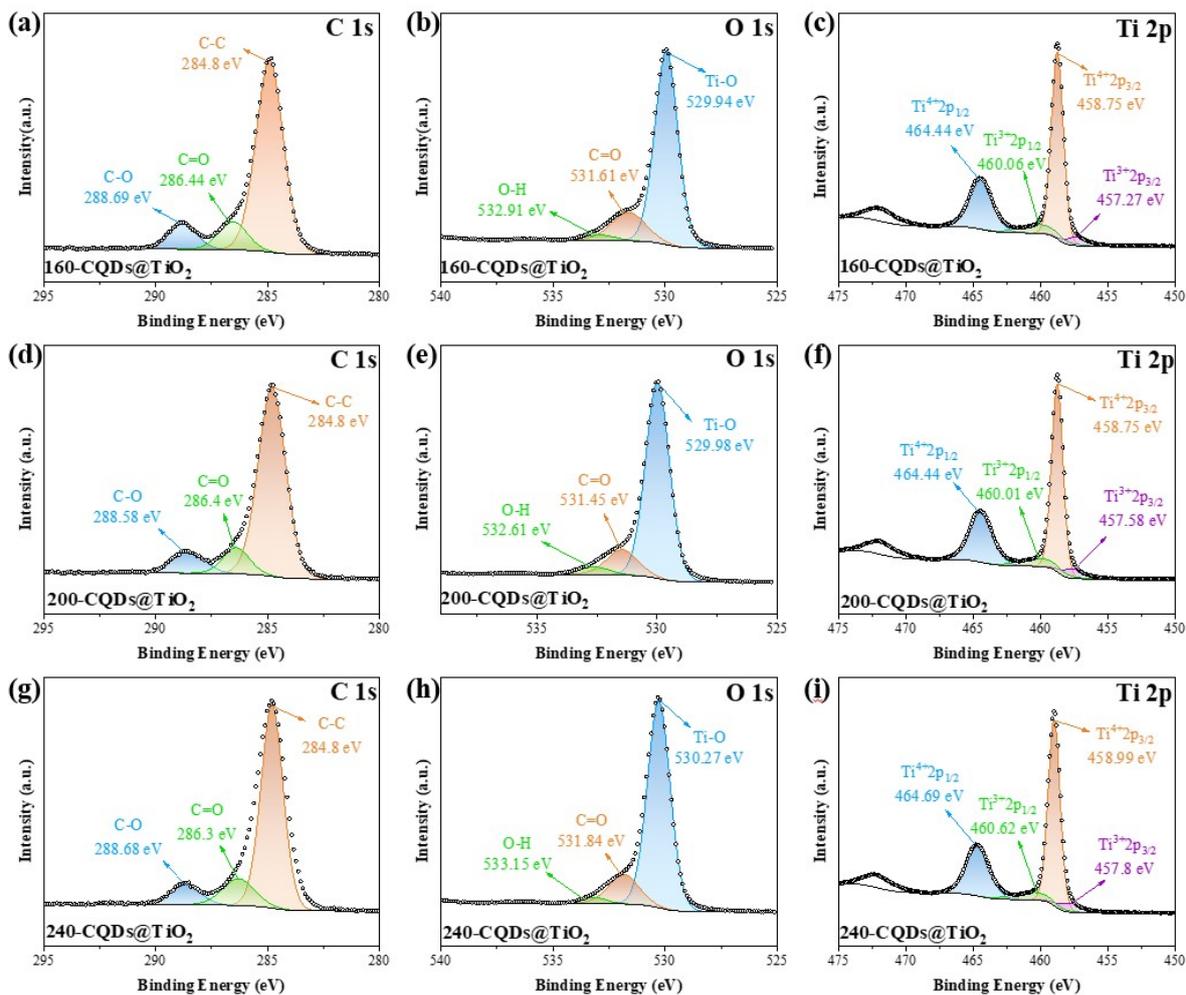


Fig. S6. High-resolution XPS spectra of (a, b, and c) 160-CQDs@TiO₂, (d, e, and f) 200-CQDs@TiO₂, and (g, h, and i) 240-CQDs@TiO₂ for C 1s, O 1s, and Ti 2p.

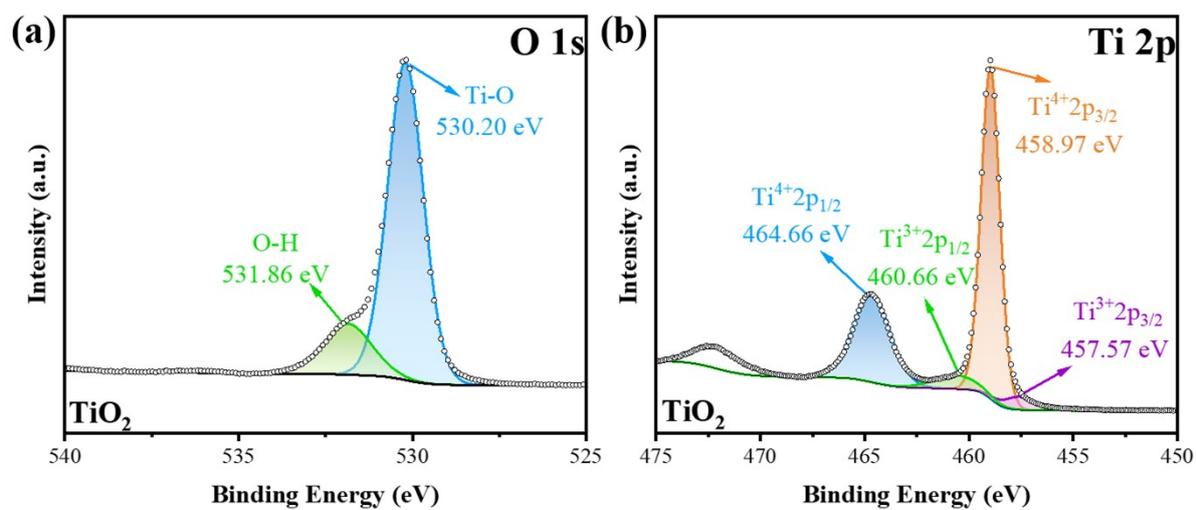


Fig. S7. High-resolution XPS spectra of (a) O 1s and (b) Ti 2p for TiO_2 .