

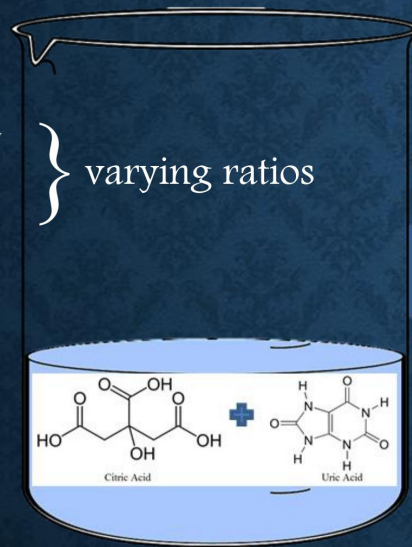
PHOTOVOLTAIC APPLICATION OF BRIGHT BLUE FLUORESCENT CARBON QUANTUM DOTS



Karan Surana and Saurabh S. Soni

C QD prepared by *Hydrothermal method*

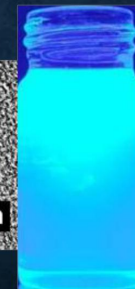
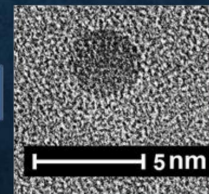
Precursor - *Citric acid*
Dopant - *Uric acid*



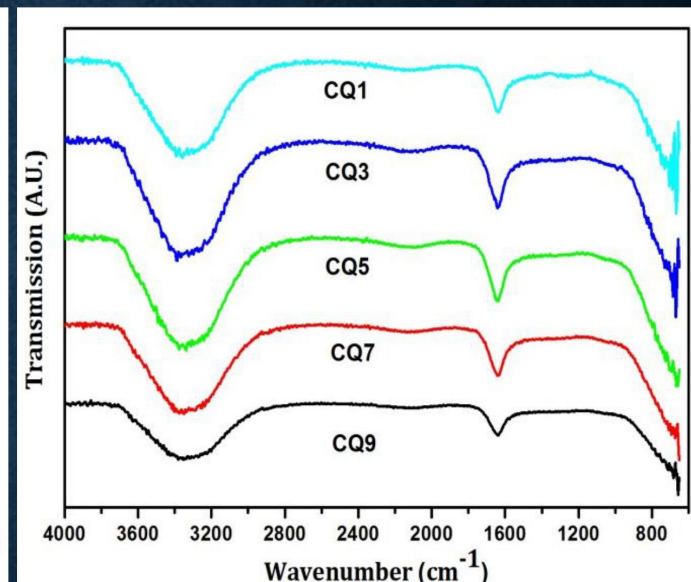
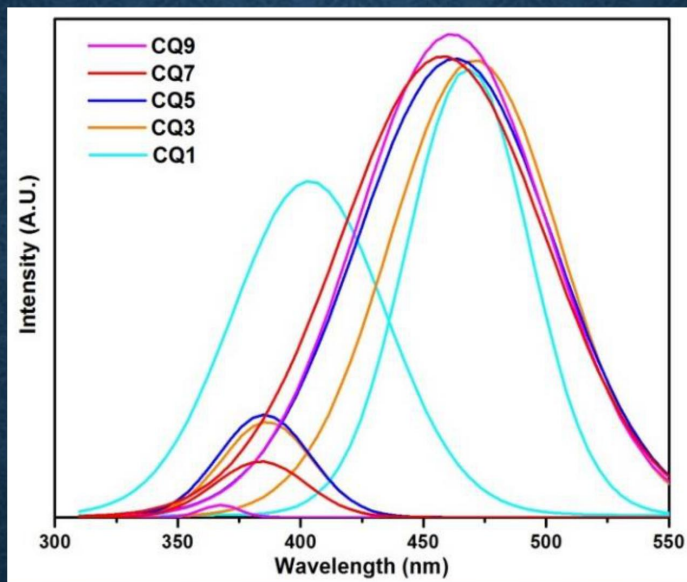
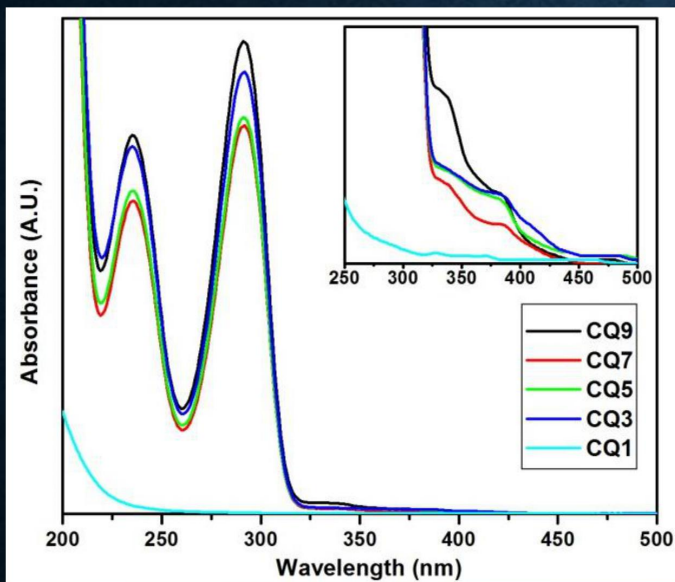
Hydrothermal Method (~175 °C)



Co-Sensitized Solar Cell



Optical Characterizations



λ_{\max} : 291.4 nm & 235.4 nm

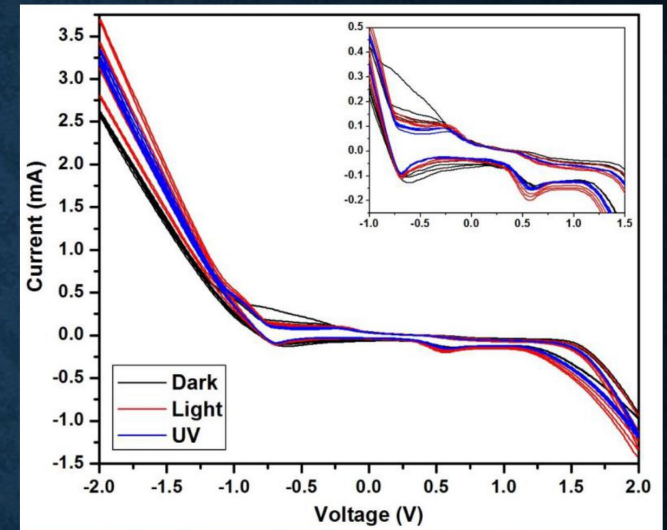
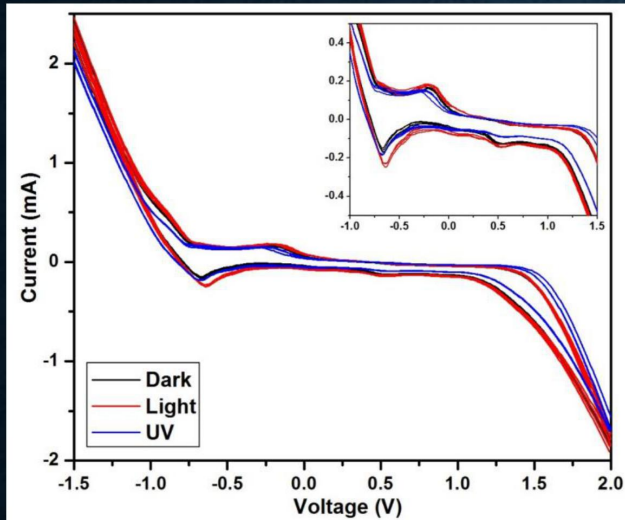
Additional small peaks at:
383.5 nm and 333.3 nm



O-H stretch
N-H stretch } 3350 cm⁻¹

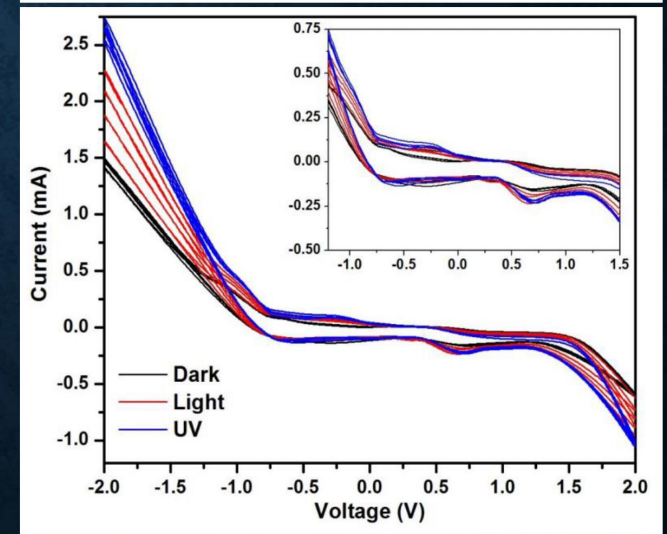
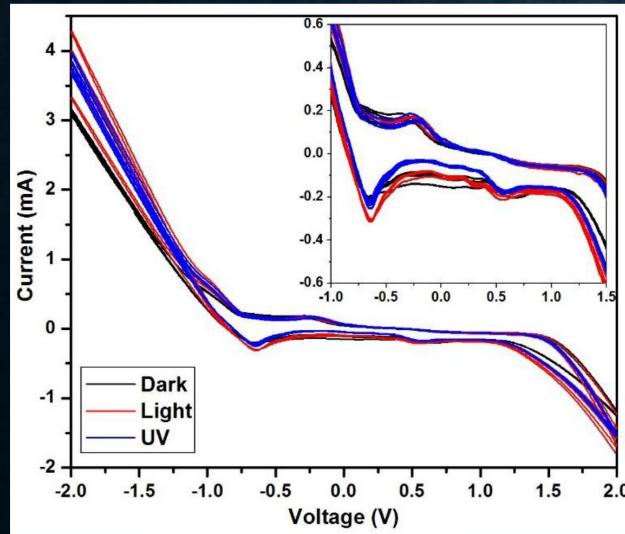
C=C stretch
N-H bend
C=N stretching } 1640 cm⁻¹

Electrical Characterizations

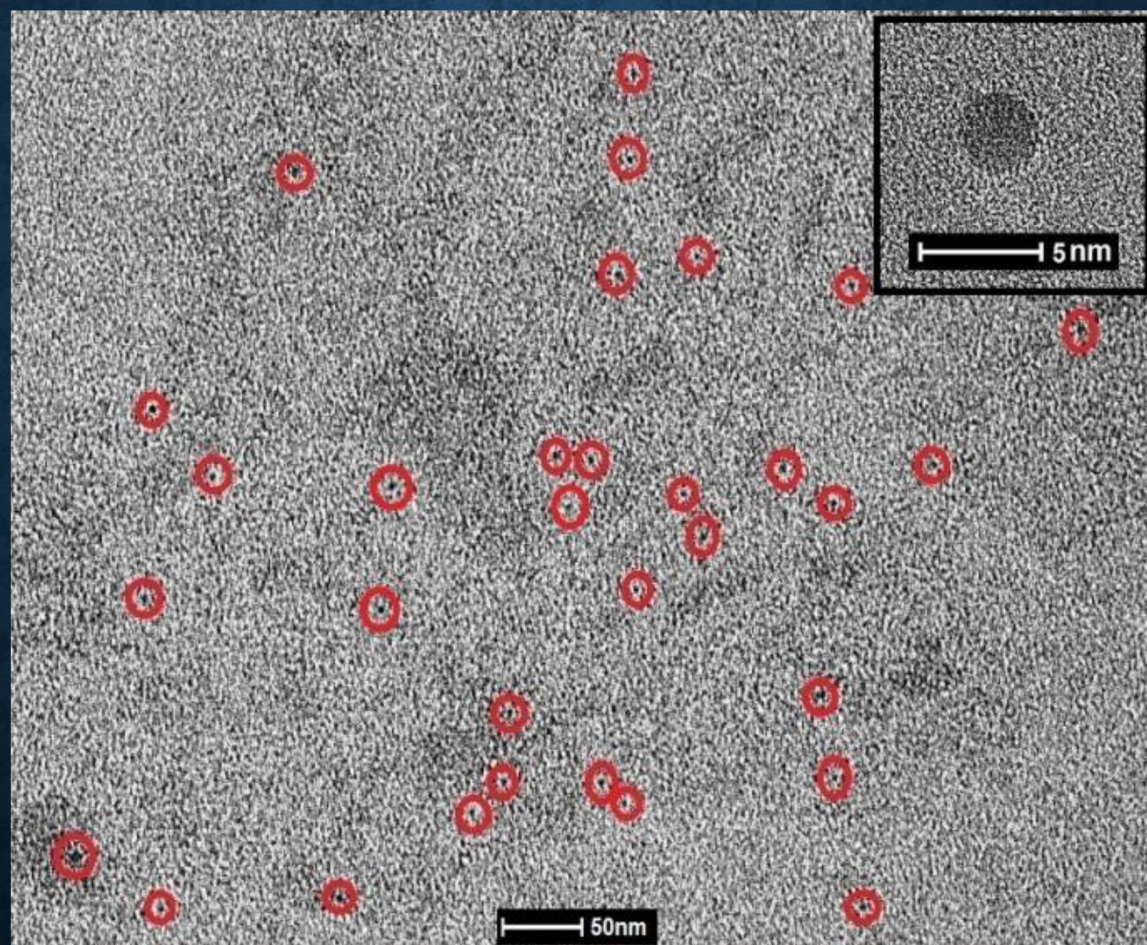


Oxidation Peaks : -0.65 V & 0.56 V

Reduction Peaks : -0.25 V & 0.44 V

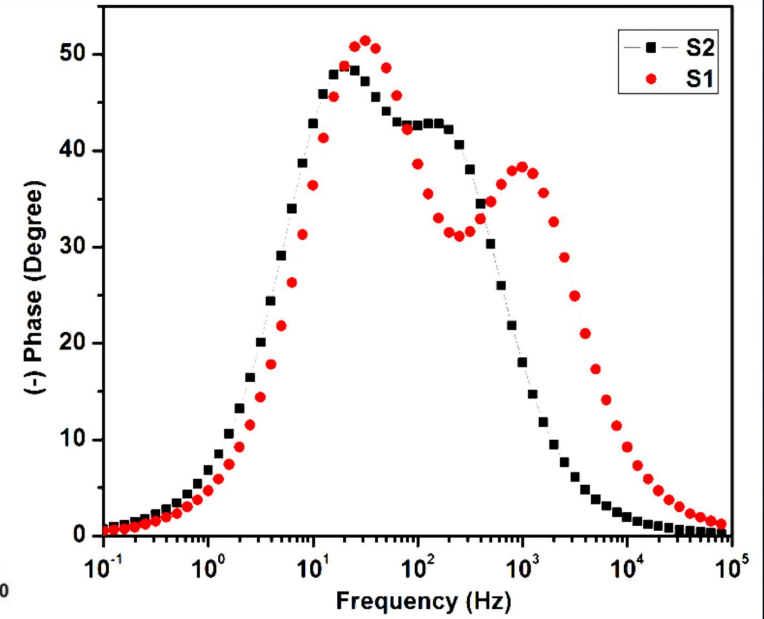
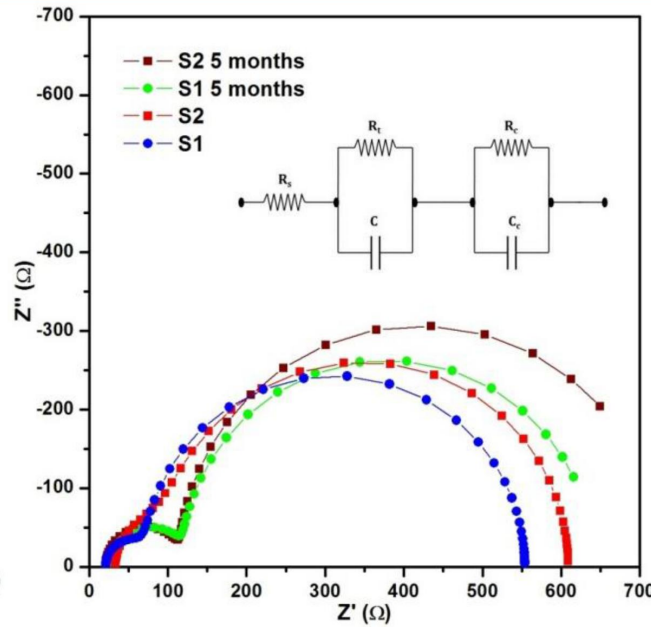
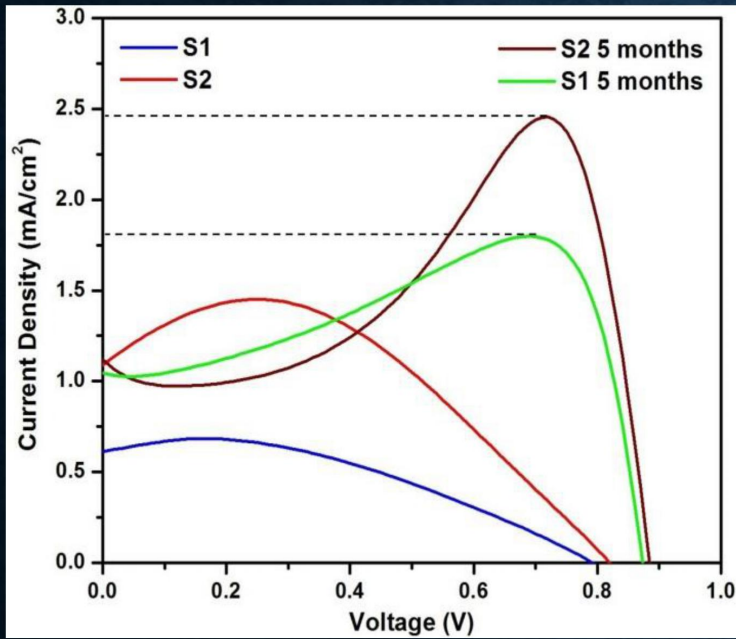


Electron Microscopy Analysis



Avg. Size – 3.4 nm

Device Characterization



| Solar Cells | V_{oc} (mV) | J_{sc} (mA/cm ²) | FF (%) | η (%) | R_s (Ω) | R_t (Ω) | R_c (Ω) | τ (ms) |
|-------------|---------------|--------------------------------|--------|------------|--------------------|--------------------|--------------------|-------------|
| S1 | 784 | 0.61 | 45.1 | 0.22 | 20.96 | 48.89 | 493.80 | 5.1 |
| S2 | 820 | 1.10 | 59.8 | 0.54 | 33.19 | 62.16 | 513.60 | 8.2 |

Conclusions

- ✓ N doped aqueous C QD prepared successfully by hydrothermal method.
- ✓ HRTEM image revealed an average particle size of 3.4 nm.
- ✓ The increase in N doping produced no change in UV–Vis absorption or FL emission but a prominent change in luminescence was observed.
- ✓ The CV studies showed the QDs were responsive to light and had a wide electrochemical window.
- ✓ The C QD co–sensitized solar cell possessed better characteristics than the corresponding DSSC.

Acknowledgement

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(BSR)/CH/20-21/0247) (Oct 2021 - present)