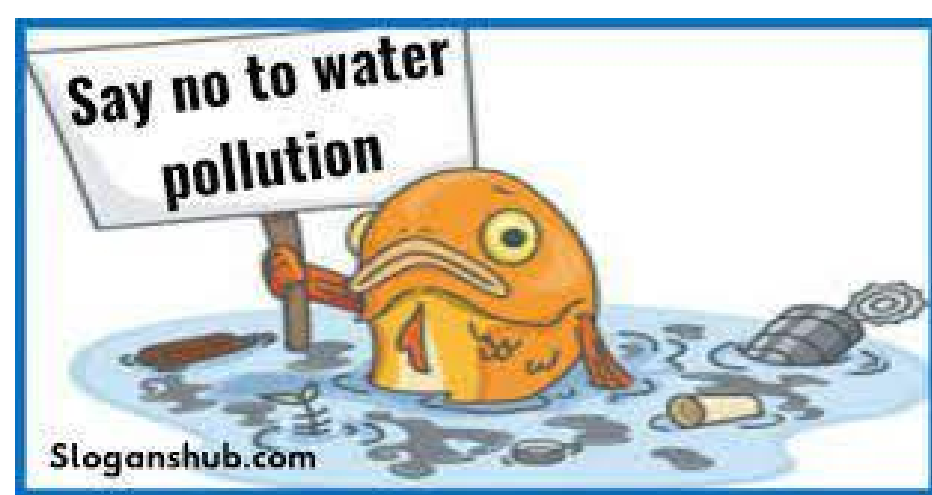


1

The critical problem



Example of pollutants (**dyes, pesticides and antibiotics**) which are **toxic to humans or the environment** to overcome the problem

Photocatalysis with the presence of the **semiconductor** and light

TiO₂ is widely used to degrade the pollutants due to its **unique properties** including **high chemical inertness, corrosion resistance, non-toxicity, cost effectiveness and environmentally friendly**

Why modified TiO₂ as the best photocatalyst?

Modification of TiO₂

- TiO₂ nanoparticles
- Doping TiO₂ with metal or non metal elements
- Formation of TiO₂ nanocomposites

Advantages

- High photocatalytic activity
- Lower bandgap energy than 3.2 eV of pure anatase
- Slow recombination rate of electron-hole pairs
- Shift the light absorption into the visible light region

Filtration issue during wastewater treatment?

The suspended TiO₂ particles are difficult to be reused for the next treatment

Designation of buoyant photocatalyst

Benefits

- Float on the surface of the water
- More accessible to light irradiation
- Exposure to the large surface area
- Easier post-treatment (require low cost)



2

Main research aim

To gain an understanding of the properties and photocatalytic performance of the fabricated C, N-TiO₂/alginate beads as a buoyant photocatalyst for the photodegradation of diazinon under solar light which has excellent potential in wastewater treatment applications

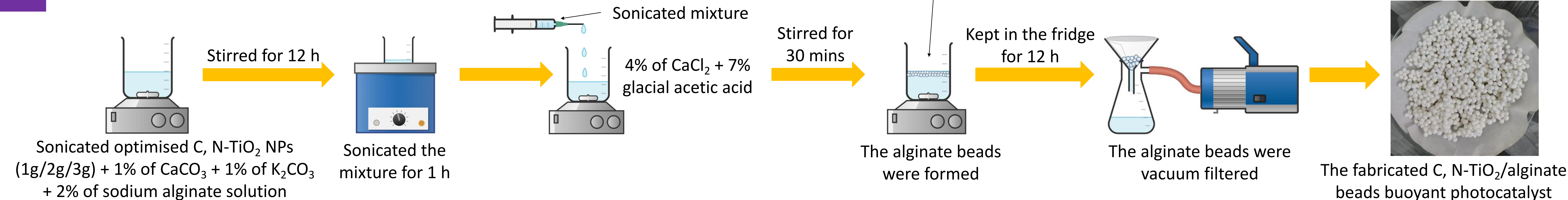
	Binding energy (eV)	Chemical bond
C 1s	284.6	C-C
	285.7	C-O and C-N
	288.5	C=O
	289.8	N-C
N 1s	398.8	N-C
	399.8	N-(C)
	400.8	Ti-N
	401.5	N-C=N
Ti 2p	402.2	N-O
	458.1	Ti ⁴⁺ 2p _{3/2}
	463.8	Ti ⁴⁺ 2p _{1/2}
	529.2	Ti-O-Ti
O 1s	529.7	C-O-Ti
	531.5	N-C-O
	533.2	-OH

✓ The XPS spectrum of Ti 2p shifts to the lower binding energy (the peak of Ti 2p of undoped TiO₂ = 459.5 eV), confirming the co-doping of carbon and nitrogen into the optimised C, N-TiO₂ NPs

3

Methodology

Synthesis of C, N-TiO₂ NPs/alginate beads buoyant photocatalyst



4

Results

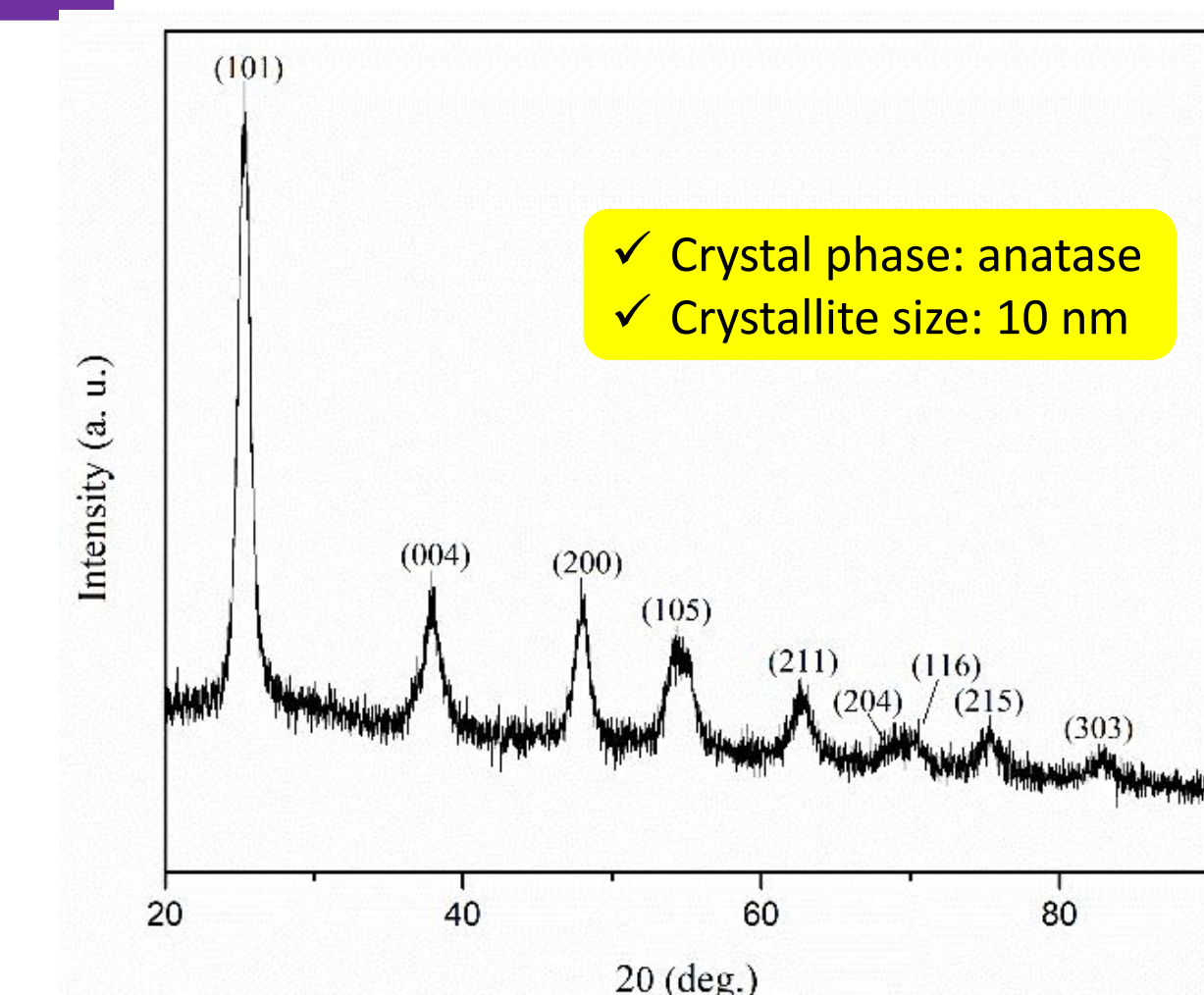


Figure 1. XRD pattern of the synthesised C, N-TiO₂ NPs. The Miller indices of the reflections are marked (Anatase phase: PDF 04-006-1918)

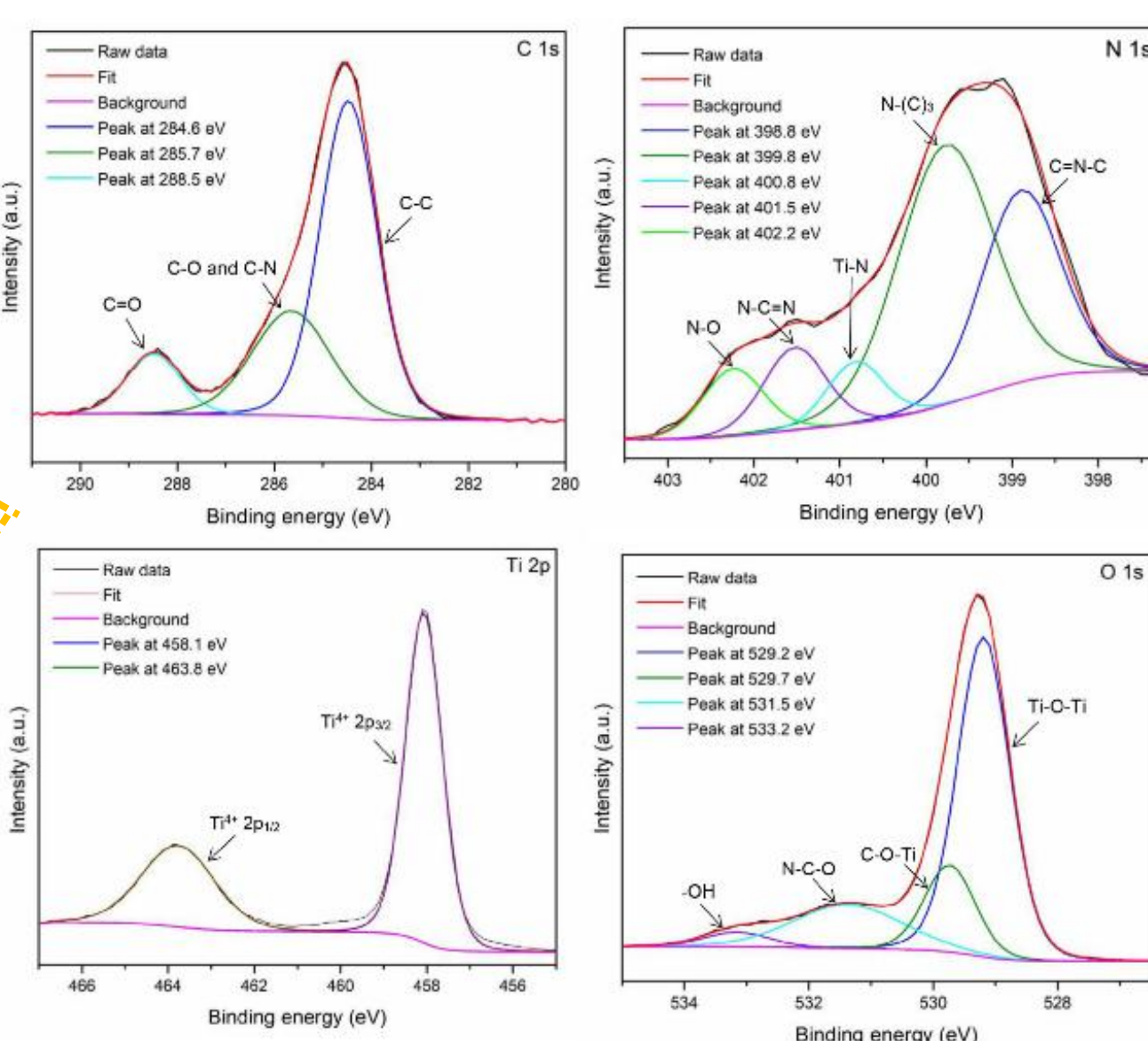


Figure 5. High resolution XPS spectra of (a) C 1s, (b) N 1s, (c) Ti 2p and O 1s of optimised C, N-TiO₂ NPs

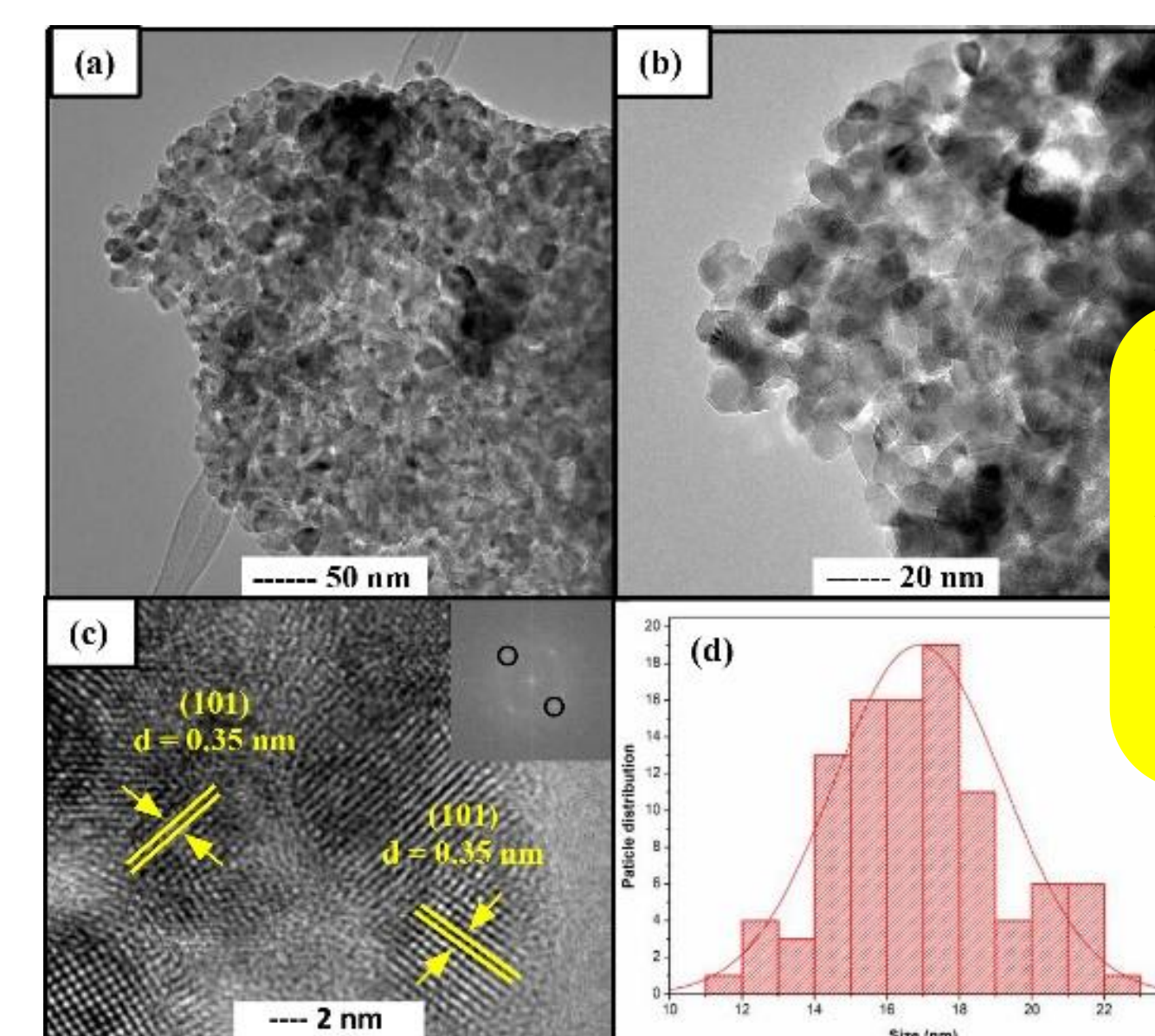


Figure 2. (a-c) HRTEM images of C, N-TiO₂ NPs with high and low magnifications. The inset in Figure (c) shows FFT image corresponding to the selected area; (d) Particle size distribution of C, N-TiO₂ NPs

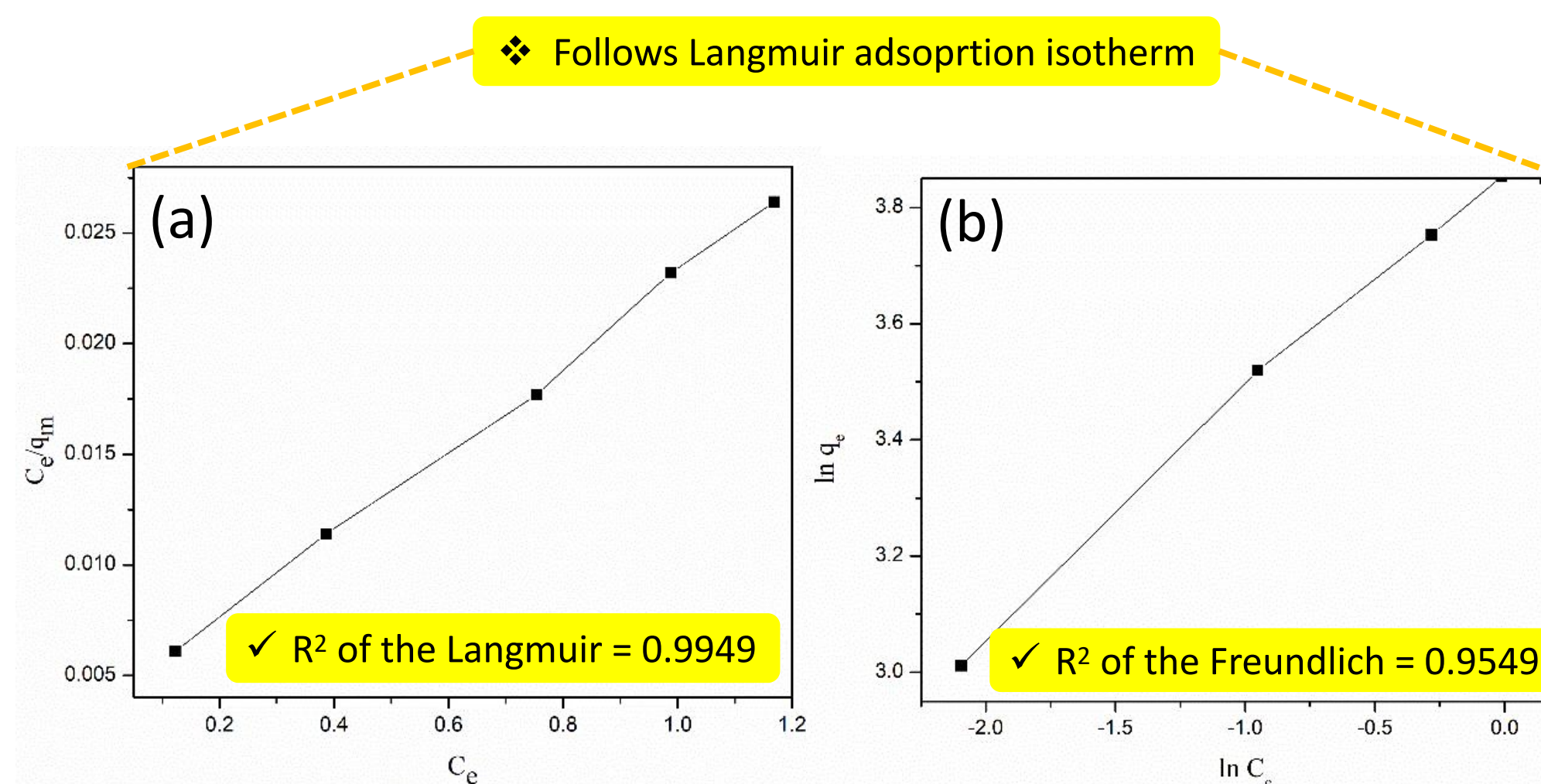


Figure 6. The (a) Langmuir and (b) Freundlich isotherms for adsorption of the optimised C, N-TiO₂ NPs/alginate beads buoyant photocatalyst

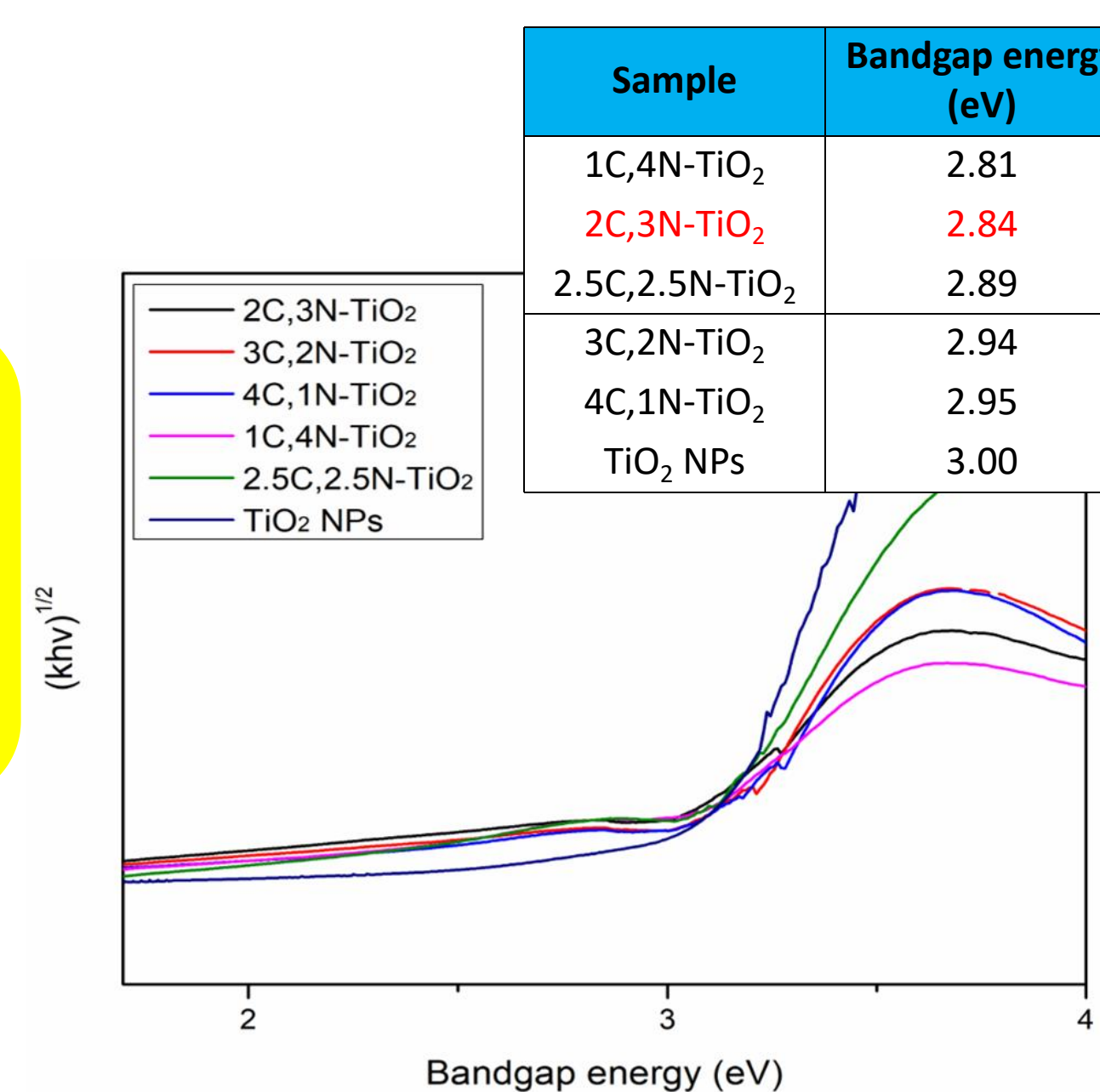


Figure 3. The optical bandgap spectra of synthesised C, N-TiO₂ NPs

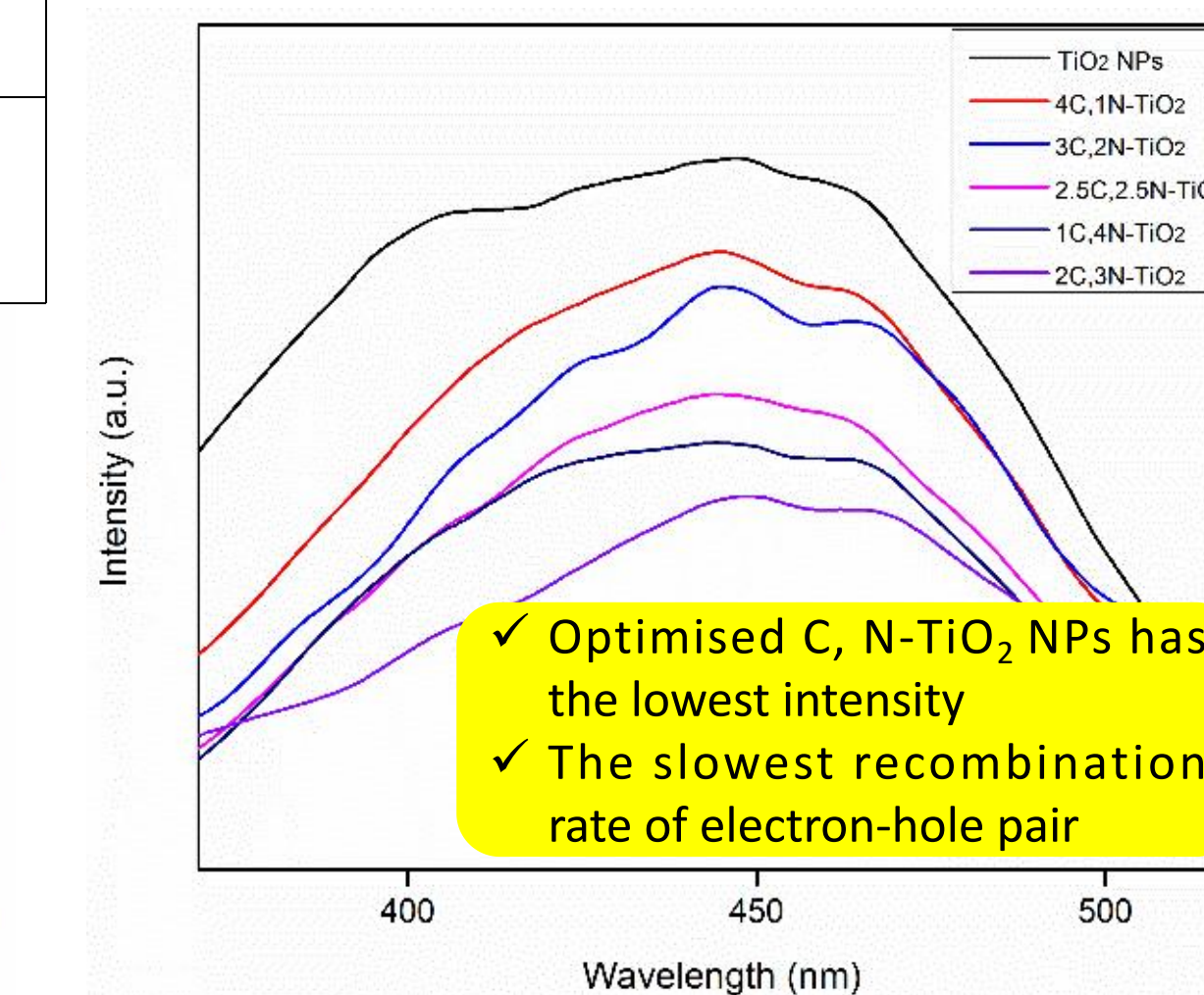


Figure 4. The photoluminescence spectra of synthesised C, N-TiO₂ NPs

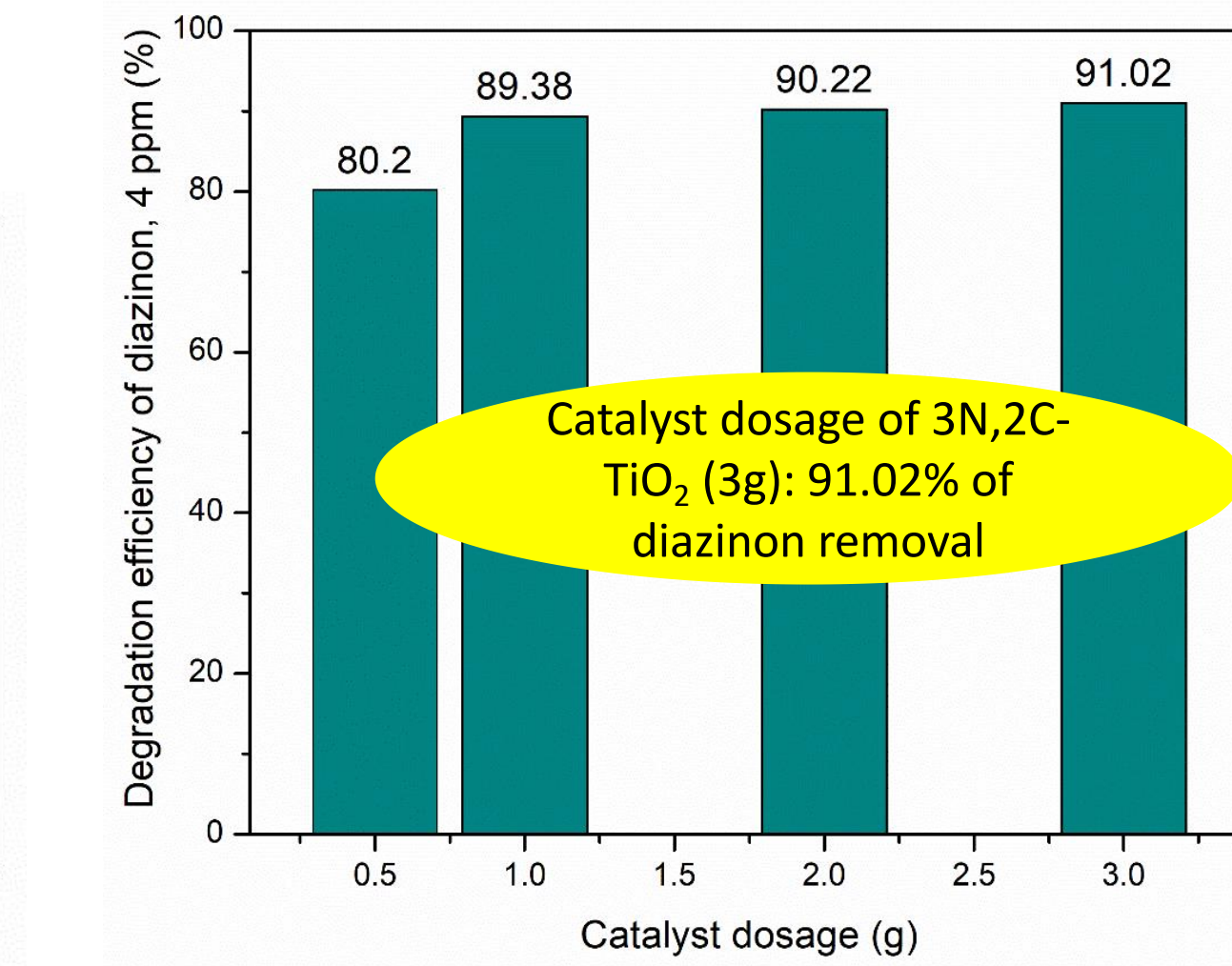


Figure 7. Degradation efficiency of diazinon with different catalyst dosage of the optimised C, N-TiO₂ NPs on the fabricated buoyant photocatalyst at diazinon's concentration of 4 ppm

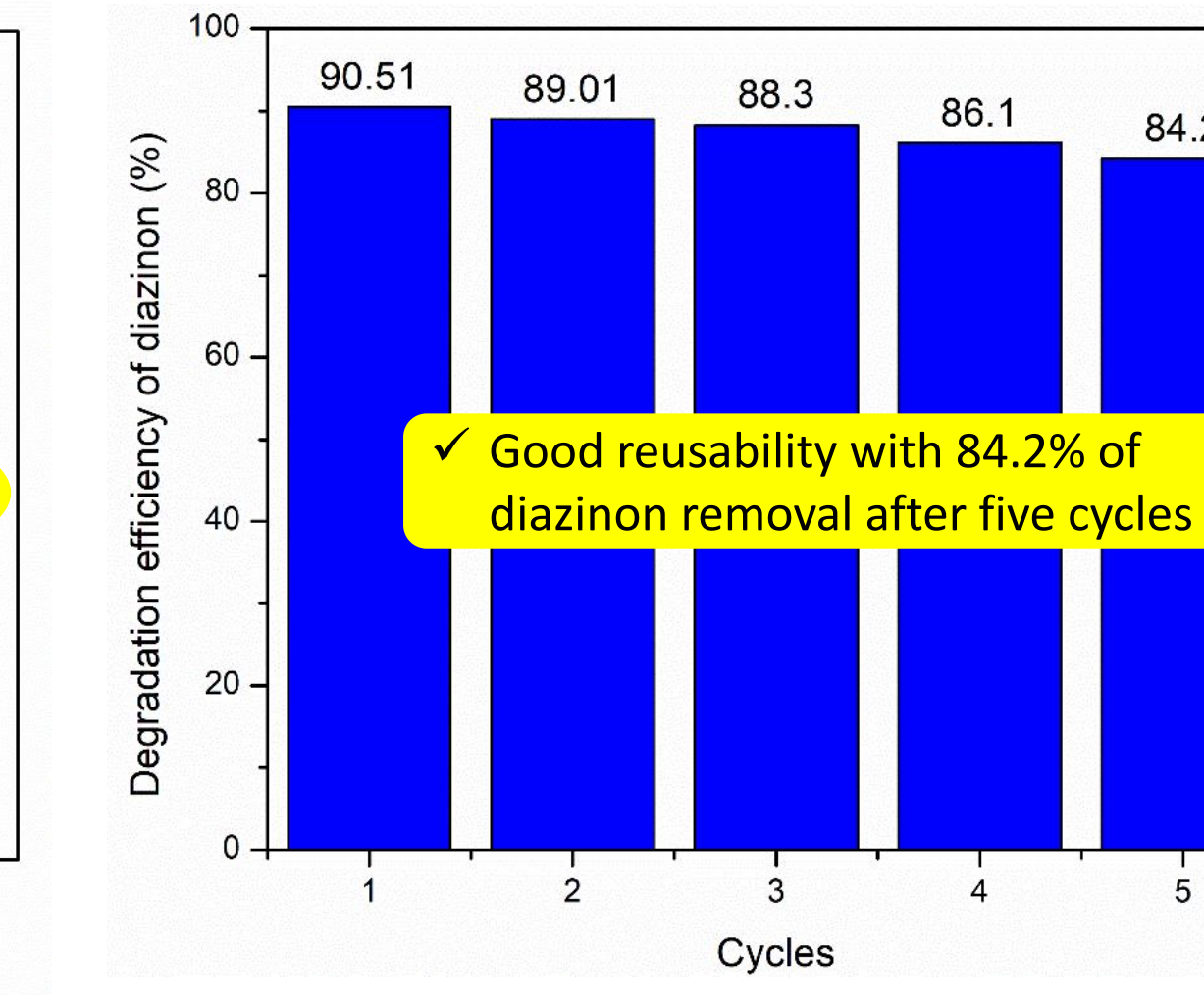


Figure 8. Reusability test of the C, N-TiO₂ NPs/alginate beads buoyant photocatalyst

5

Conclusion

The unique solar light-irradiated C, N-TiO₂/alginate beads buoyant photocatalyst has been successfully designed and can be used in wastewater treatment application efficiently

ACKNOWLEDGEMENT

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