Supplementary information

One-Pot Synthesis of Green-Emitting Nitrogen-Doped Carbon Dots from Xylose

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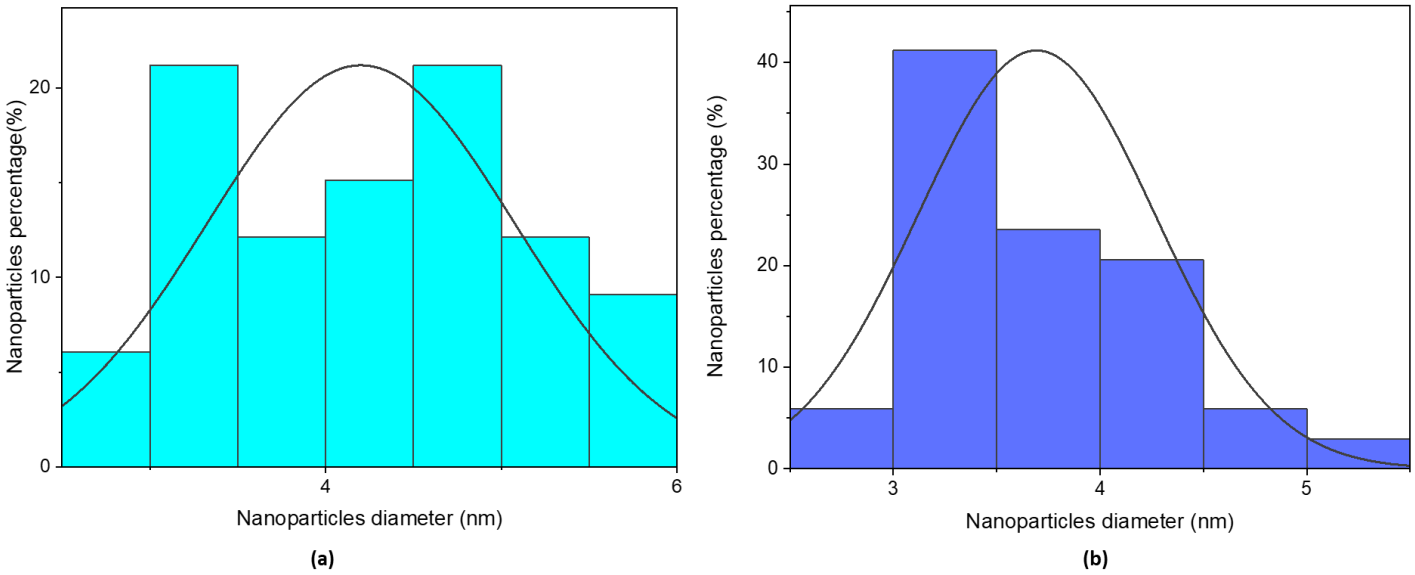

Figure S1. Size histograms of N-CDs synthesized using 100 mg $VOPO_4$ as catalyst, 0.75M of xylose as C precursor, NH_4Cl as dopant and 17 g/L of CH_3COOH at 180ºC after 4h of reaction calculated from TEM images.

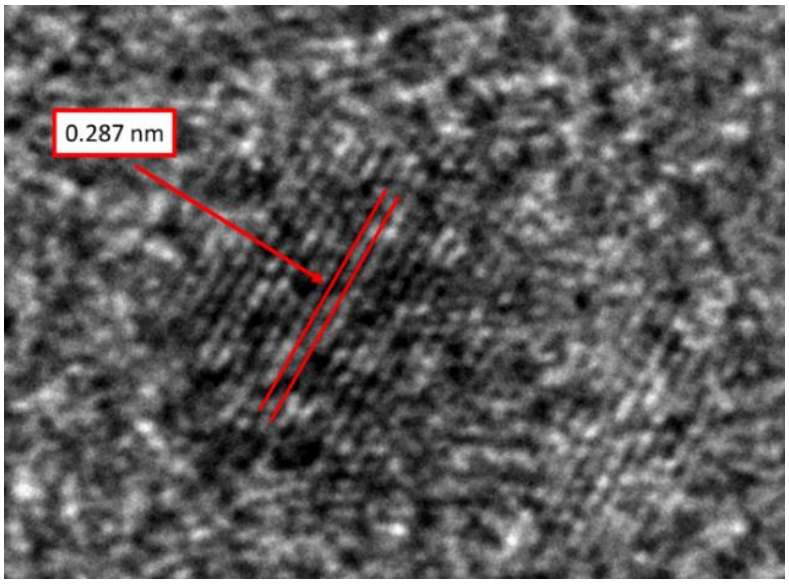

Figure S2. Graphitic spacing of N-CDs dialyzed solution samples synthesized using 100 mg $VOPO_4$ as catalyst, 0.75M of xylose as C precursor, NH_4Cl as dopant and 17 g/L of CH_3COOH at 180ºC after 4h of reaction.

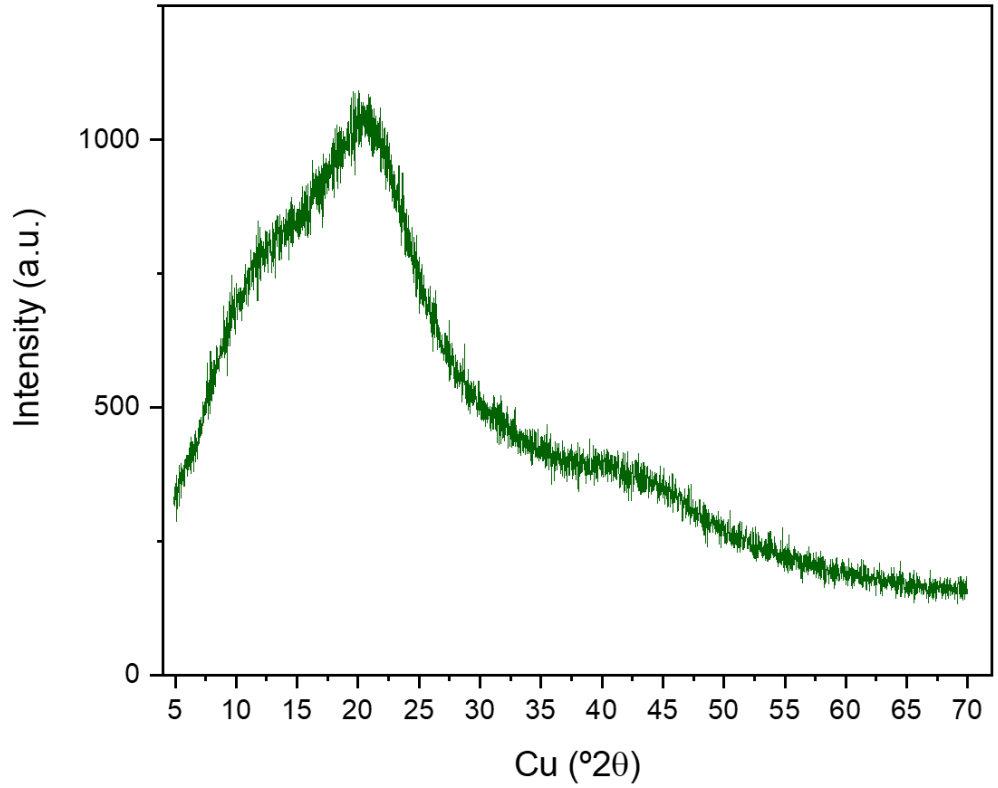

Figure S3. XRD pattern of dialyzed and lyophilized N-CDs synthesized using 100 mg $VOPO_4$ as catalyst, 0.75M of xylose as C precursor, NH_4Cl as dopant and 17 g/L of CH_3COOH at 180ºC after 4h of reaction.

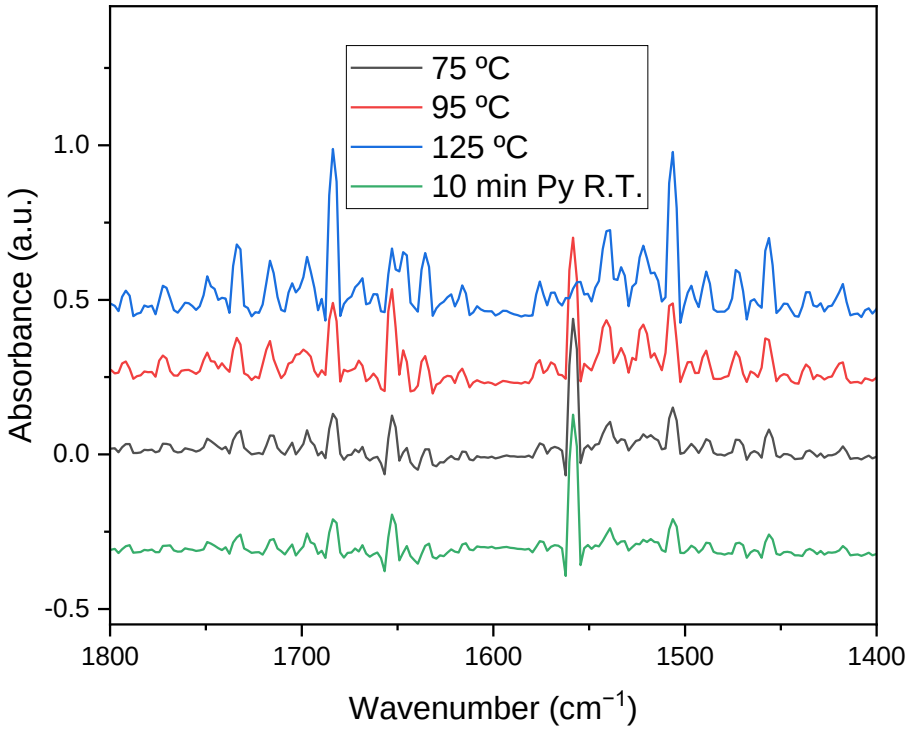

Figure S4. Spectra of the pyridine adsorption and desorption at different temperatures on $VOPO_4$ followed by FTIR.°

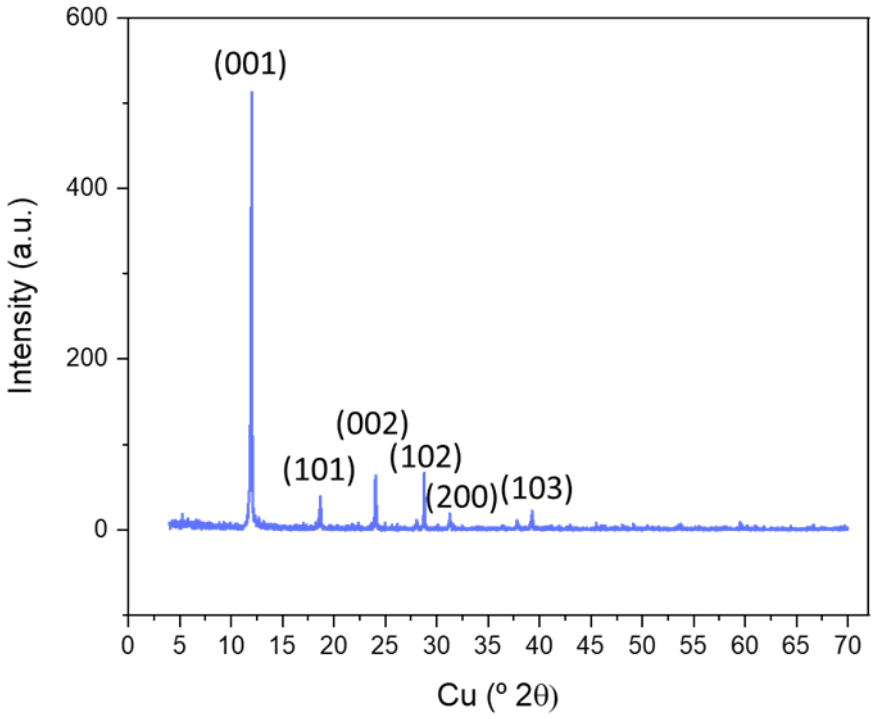

Figure S5. XRD pattern of freshly synthesized $VOPO_4$.

The diffractogram of the vanadyl phosphate (Figure S5) presents only the characteristic and expected diffraction peaks of the α-VOPO4·2H2O (PDF: 00-036-1472), no other segregated phase being detected. The peak appearing at the lowest angle corresponds with the (001) plane [1] and in that direction the crystal size is 363 nm, determined according to the Scherrer equation.

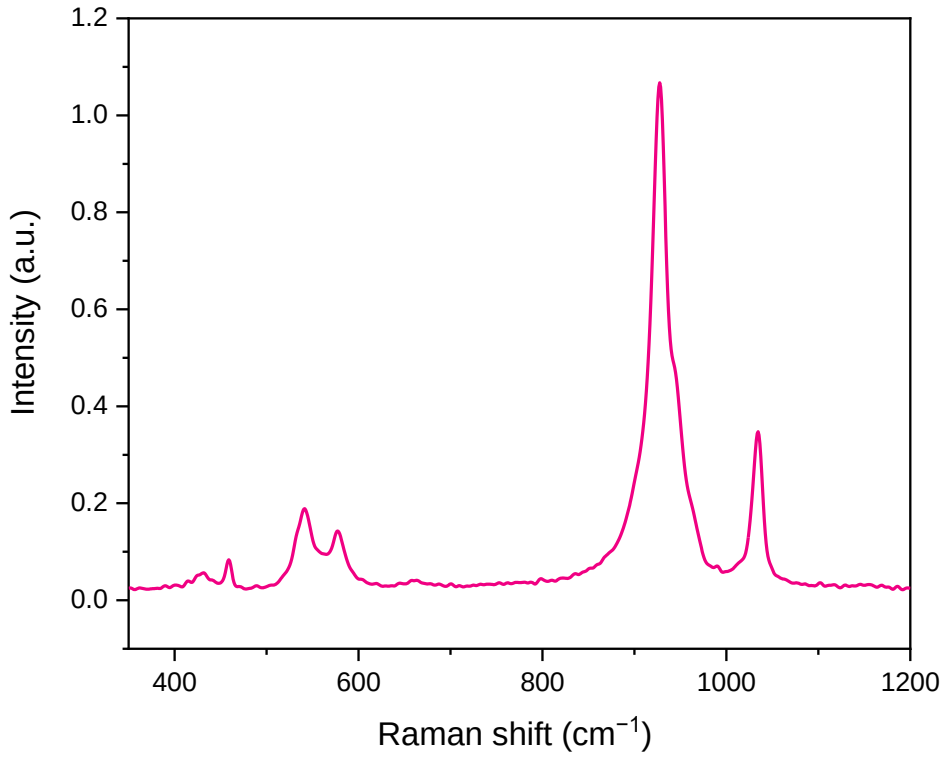

Figure S6. Raman spectrum of freshly synthesized $VOPO_4$.

The Raman spectra of the vanadium (Figure S6) catalyst is similar to other published in bibliography [2, 3, 4, 5, 6]. Thus, the strong band at 925 cm^{-1} is due to the symmetric stretching vibration of phosphate groups. In addition, the bands corresponding the symmetric bending vibrations at 536 and 576 cm^{-1} are observed [2] (Trchová *et al.*,1999). Finally, the vanadyl stretching vibration lies on 1033 cm^{-1}.

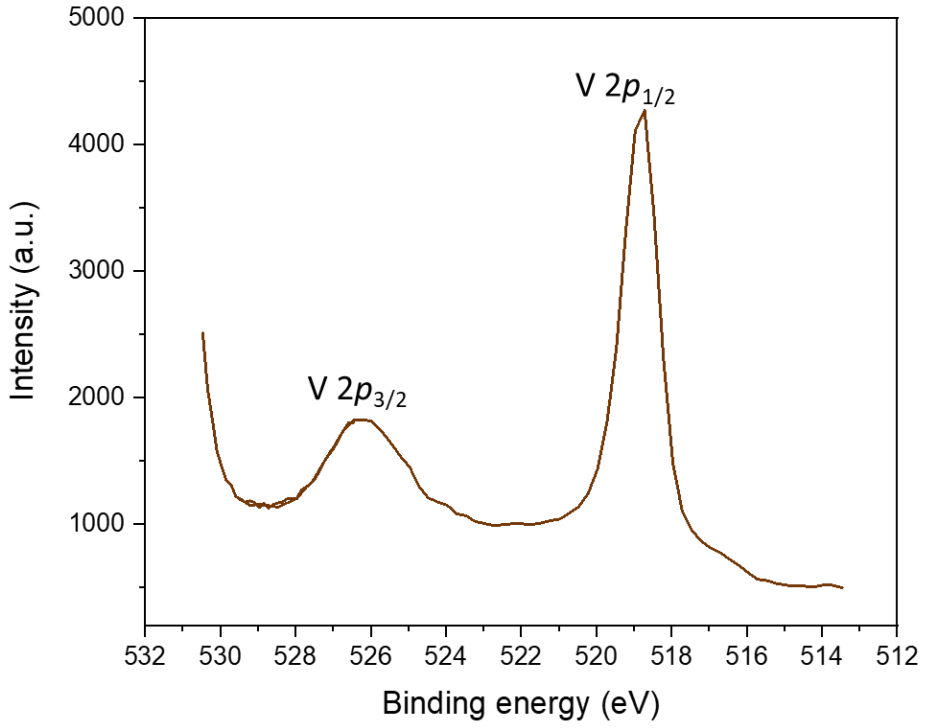

Figure S7. XPS spectrum of V 2*p* core level binding energy of freshly synthesized $VOPO_4$.

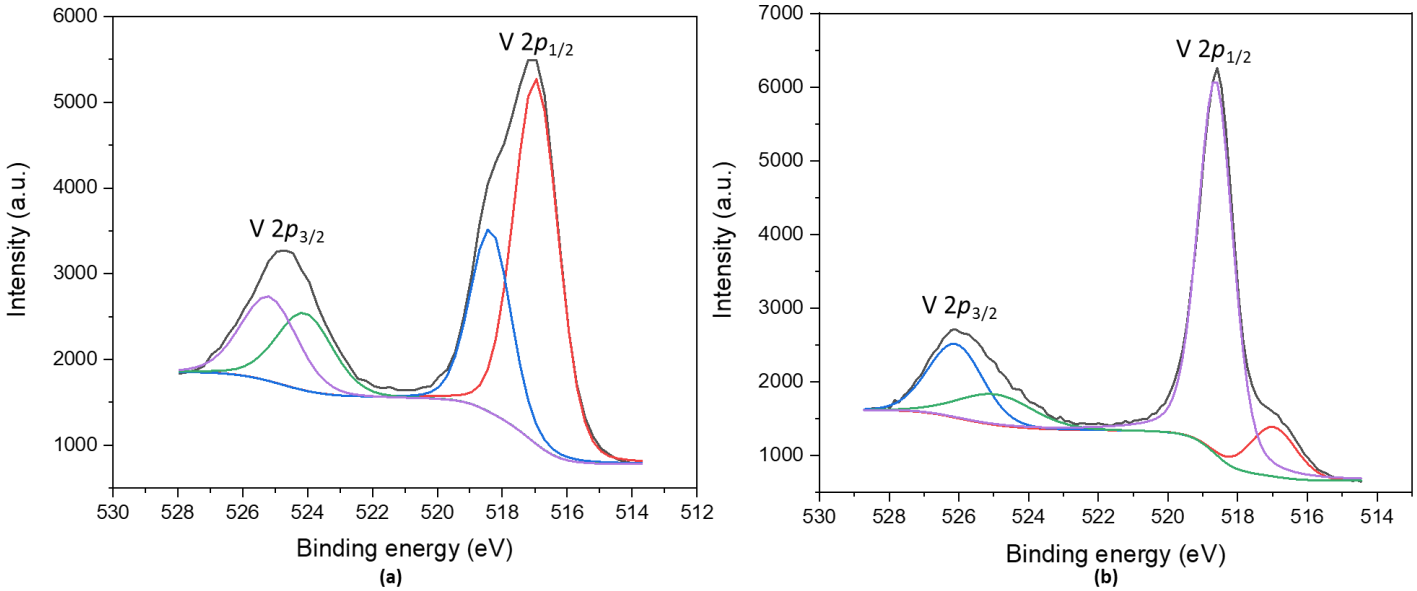

Figure S8. XPS spectra of V 2*p* core level binding energy of (**a**) $VOPO_4$ before reaction* (**b**) $VOPO_4$ after reaction.

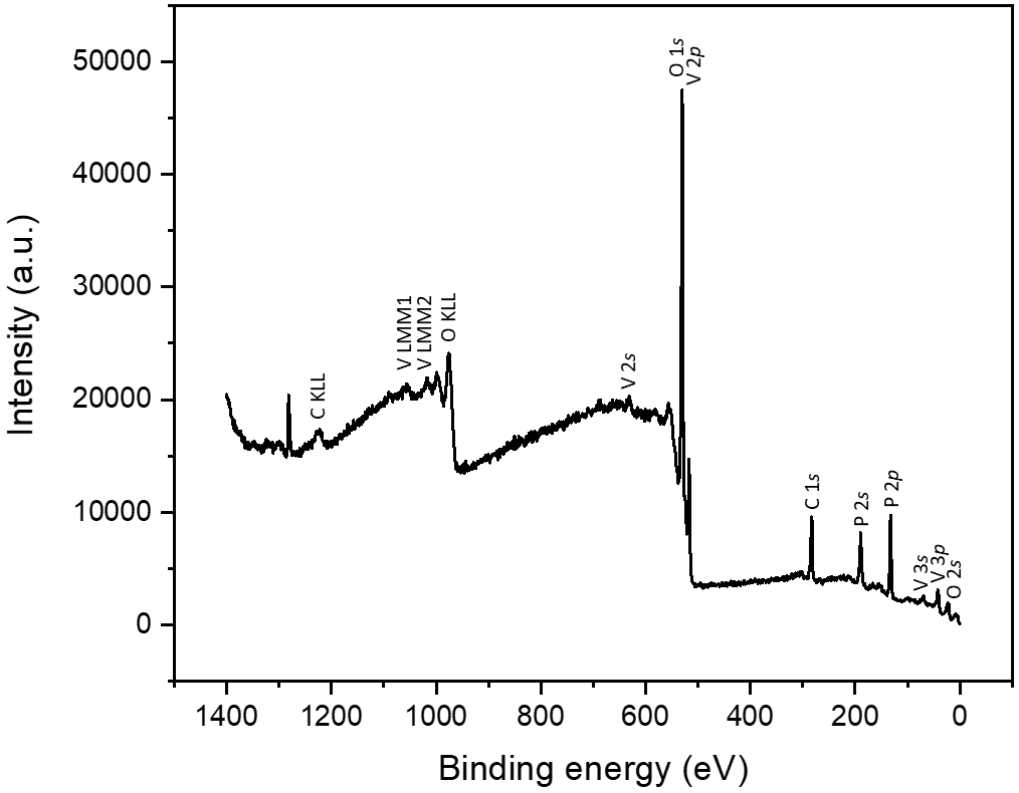

Figure S9. Survey XPS spectrum of freshly synthesized $VOPO_4$.

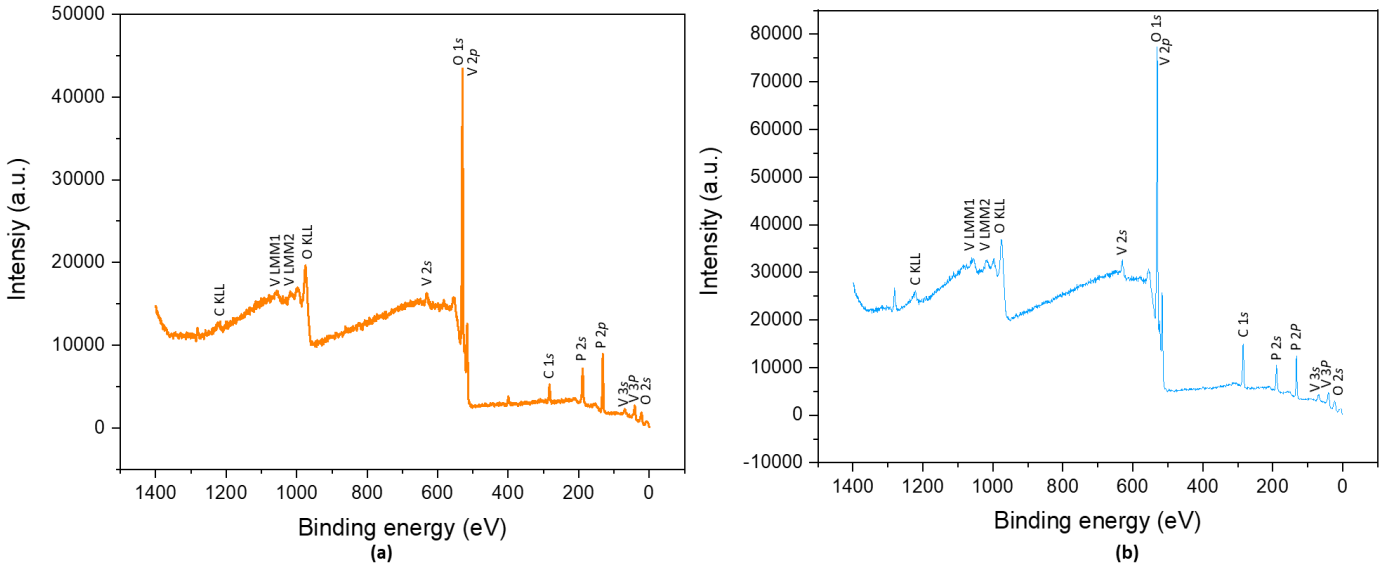

Figure S10. Survey spectra of (**a**) $VOPO_4$ before reaction* (**b**) $VOPO_4$ after reaction.

Table S1. XPS atomic concentration of $VOPO_4$.

$VOPO_4$	C (1*s*)	O (1*s*)	P (2*p*)	V (2*p*)	V/P (XPS)
Fresh	16.76	64.23	13.89	13.12	0.94
After reaction	25.50	59.73	9.20	6.58	0.71

Table S2. XPS binding energy deconvoluted bands of $VOPO_4$.

$VOPO_4$	C1*s* (eV)	O1*s* (eV)	P2*p* (eV)	V2*p* (eV)	V species
Fresh	284.8(61.12%) 286.0(38.88%)	531.6(48.48%) 533.0(51.52%)	133.7(28.58%) 134.5(71.42%)	517.2 (3.66%) 518.8 (70.73%)	V(V) ($2p_{1/2}$ band) V(V) ($2p_{1/2}$ band)
Before* reaction	284.8(76.43%) 286.3(14.44%) 287.9(4.82%)	531.3(48.03%) 533.0(51.97%)	133.5(22.75%) 134.6(77.25%)	515.0(18.25%) 516.4(53.41%)	V(IV) ($2p_{1/2}$ band) V(V) ($2p_{1/2}$ band)
After reaction	289.3(4.31%) 283.1(26.43%) 284.7(42.16%) 286.2(31.42%)	529.5(51.65%) 531.0(48.35%)	133.9(32.68%) 134.0(67.32%)	515.2(47.59%) 516.6(25.31%)	V(IV) ($2p_{1/2}$ band) V(V) ($2p_{1/2}$ band)

* Before reaction indicates that the catalyst and reactants have been brought into contact, but the reaction has not yet started.

Table S3. ICP-MS measurements of vanadium species in N-CDs dialyzed solutions.

ICP-MS	V in N-CDs after 2h of reaction time	V in N-CDs after 4h of reaction time
$\mu gV/g_{catalyst}$	73	69

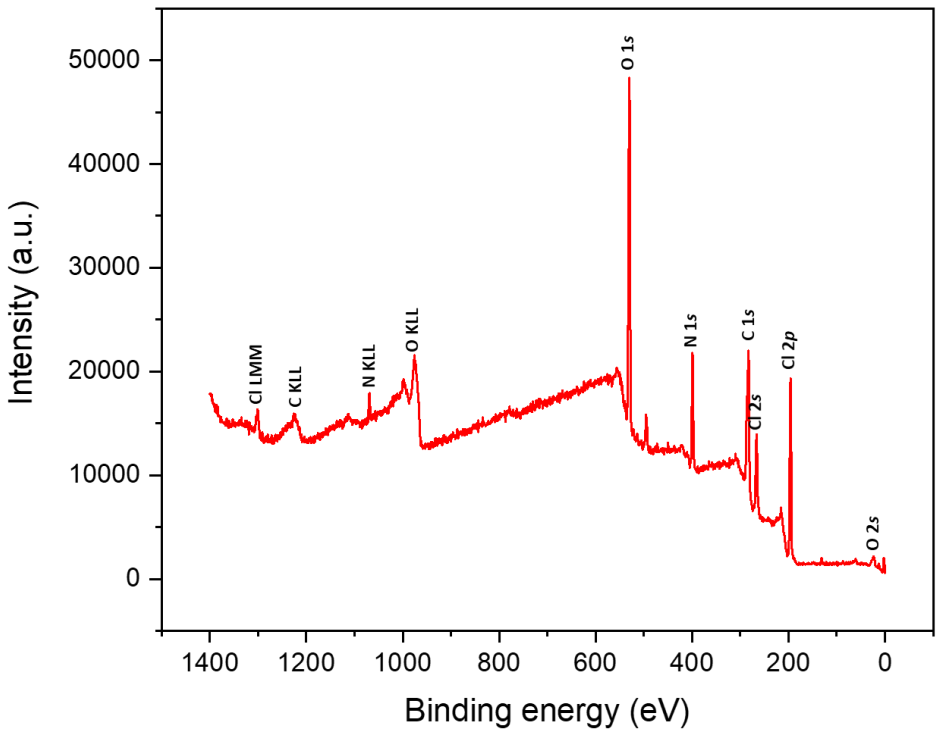

Figure S11. XPS survey spectrum of dialyzed and lyophilized N-CDs synthesized using 100 mg $VOPO_4$ as catalyst, 0.75M of xylose as C precursor, NH_4Cl as dopant and 17 g/L of CH_3COOH at 180ºC after 4h of reaction.

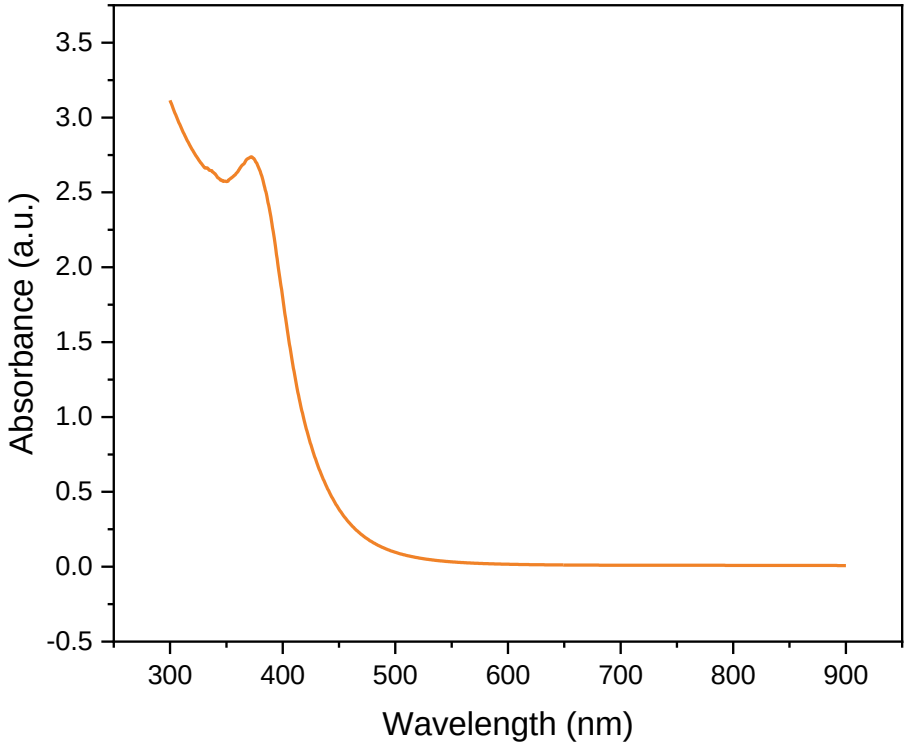

Figure S12. UV-vis spectrum of dialyzed N-CDs solution synthesized using 100 mg $VOPO_4$ as catalyst, 0.75M of xylose as C precursor, NH_4Cl as dopant and 17 g/L of CH_3COOH at 180ºC after 4h of reaction carried out from 300 nm to 900 nm. No dilution was perfomed prior to the analysis.

References:

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