

Efforts To Sustainable Energy Using Nitrogen Doped Carbon Dot/Nano-onions Composites As Counter Electrode Material In Dye Sensitized Solar Cells

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INTRODUCTION

In recent years, a great emphasis on renewable sources of energy have emerged in response to rising energy demands and concerns [2]. Thus, there is a great need to develop technologies that are able to store/convert energy and provide that energy whenever a high demand arises. Amongst the available solar cell technologies, dye-sensitized solar cell (DSSC) are deemed as a possible solution to our energy concerns. In this study, nitrogen doped carbon nanodots (N-Cdots): functionalized carbon nano-onions (CNOs) composites will be employed as counter electrode material in DSSC with the aim of providing accessible, sustainable power capacity is always available.



Figure 1: Images of power plant exhibiting pollution + solar panel (renewable energy source).

METHODOLOGY



Figure 2: Microwave rotor used in synthesizing N-Cdots.

To synthesize the various N-Cdots, a one-pot microwave synthesis method was employed were 1 g of precursor (citric acid + ethylenediamine (N-Cdots EDA), citric acid + urea (N-Cdots Urea) and Fumaronitrile (N-Cdots FN)) was mixed with 20 mL of distilled water and placed in a microwave rotor for 7 minutes reaction time at 700 W. After synthesis, the collected N-Cdots were centrifuged and filtered then dried using a rotary evaporator at 75 °C.

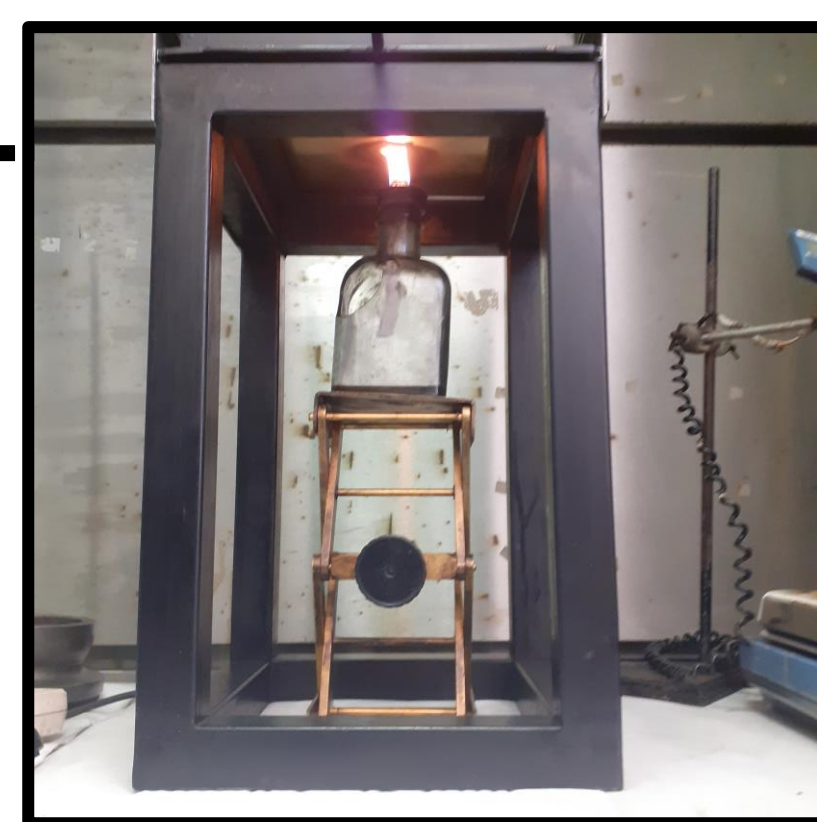


Figure 3: Flame pyrolysis system

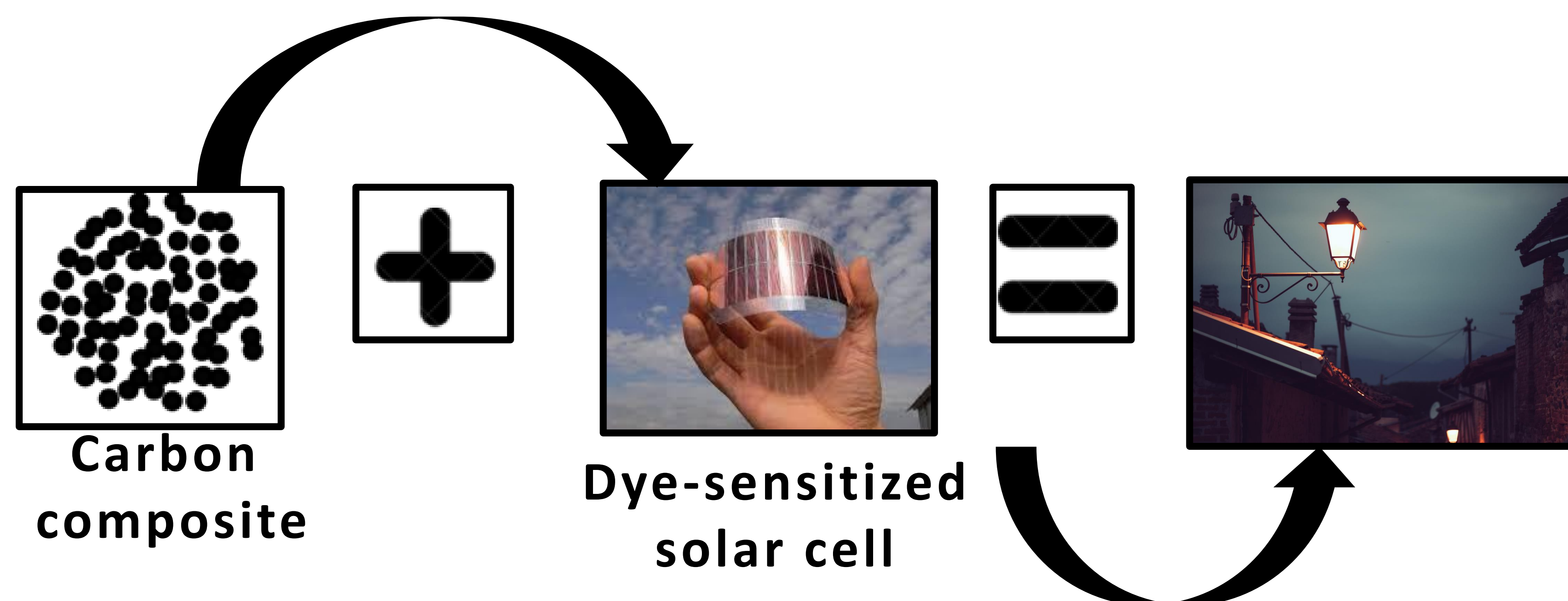


Figure 4: Image presenting aim of study as a schematic diagram.

CONCLUSION & FUTURE WORK

The TEM images of the N-Cdots are quasi-spherical and monodispersed. The TEM of the CNOs also showed quasi-spherical with a dense multi-layered structure. All images show that the CNOs are connected in accretion form. Carbonization of the as-prepared carbon material was confirmed by observing their PXRD patterns. The N-Cdots show a complete patterns which indicate a complete conversion to a graphite-like material due to the broad peaks. The doped material demonstrated a characteristic broad carbon peak centered at ~24 θ degree corresponding to the 002 plane of carbon. The PXRD patterns of the CNOs also showed that the material was fairly composed of carbon. All CNOs patterns exhibited a carbon peak at ~24 θ degree and the functionalized CNOs exhibited a second peak at ~51 θ degree which can be attributed to the 002 and 004 planes of carbon, respectively [3]. Future work include incorporating the all-carbon composite into DSSC as counter-electrode material.

REFERENCES

- Figures 1 and 4: Images from Google
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- Dhurvey YR, Kawtikwar PS, Sakarkar DM. International Journal of ChemTech Research. 4 (2012); p 187

RESULTS

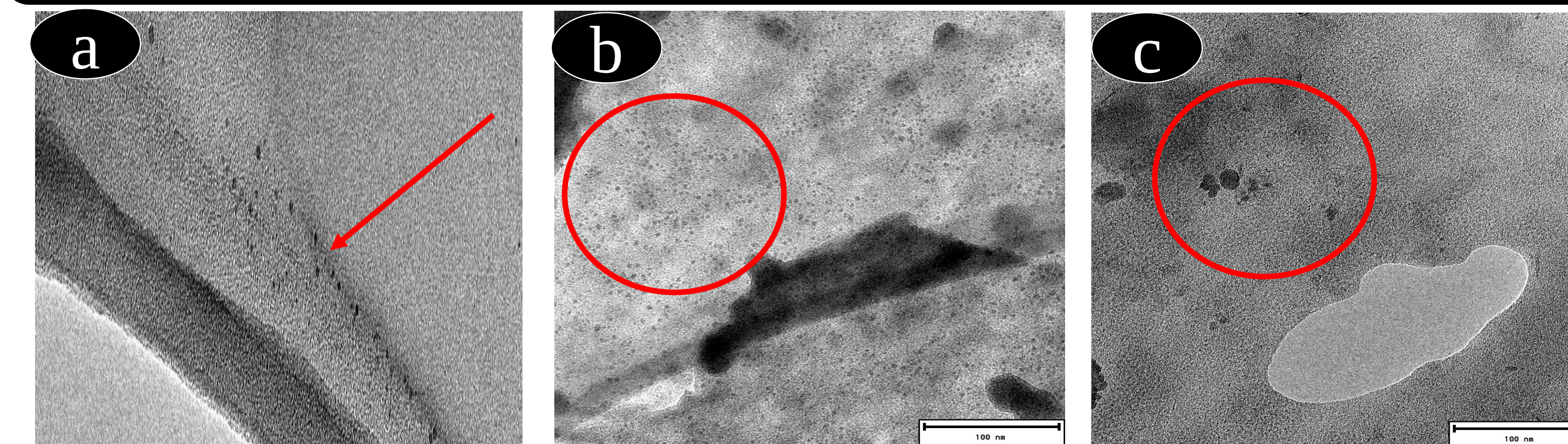


Figure 5: TEM Images of a) N-Cdots (EDA), b) N-Cdots (Urea) and c) N-Cdots (FN)

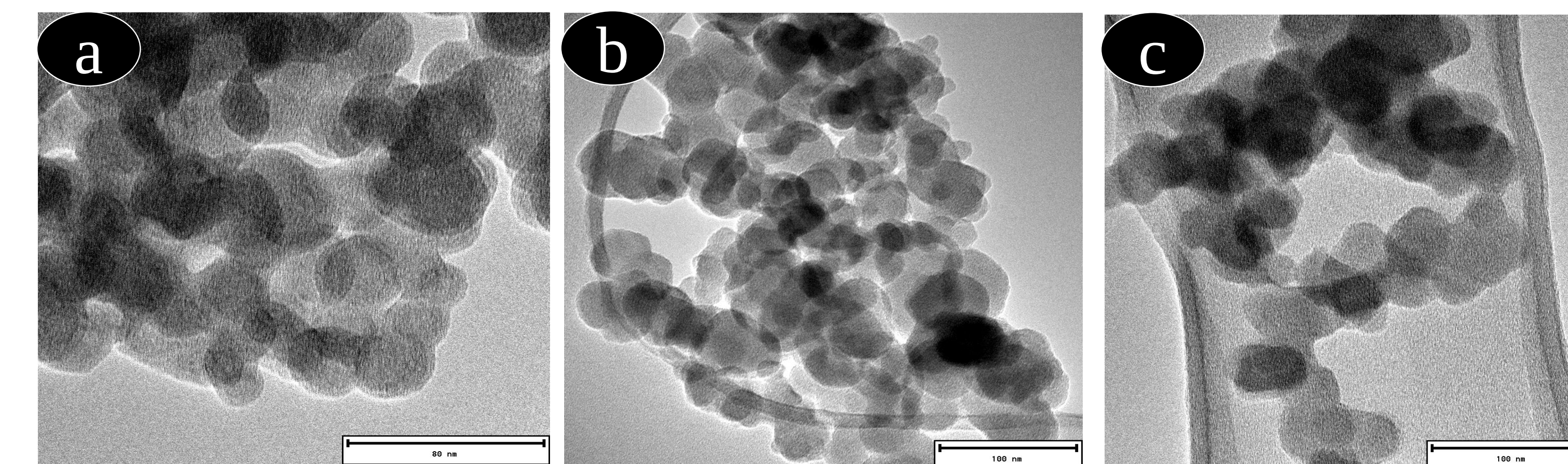


Figure 6: TEM Images of a) p-CNOs, b) ox-CNOs and c) N-CNOs

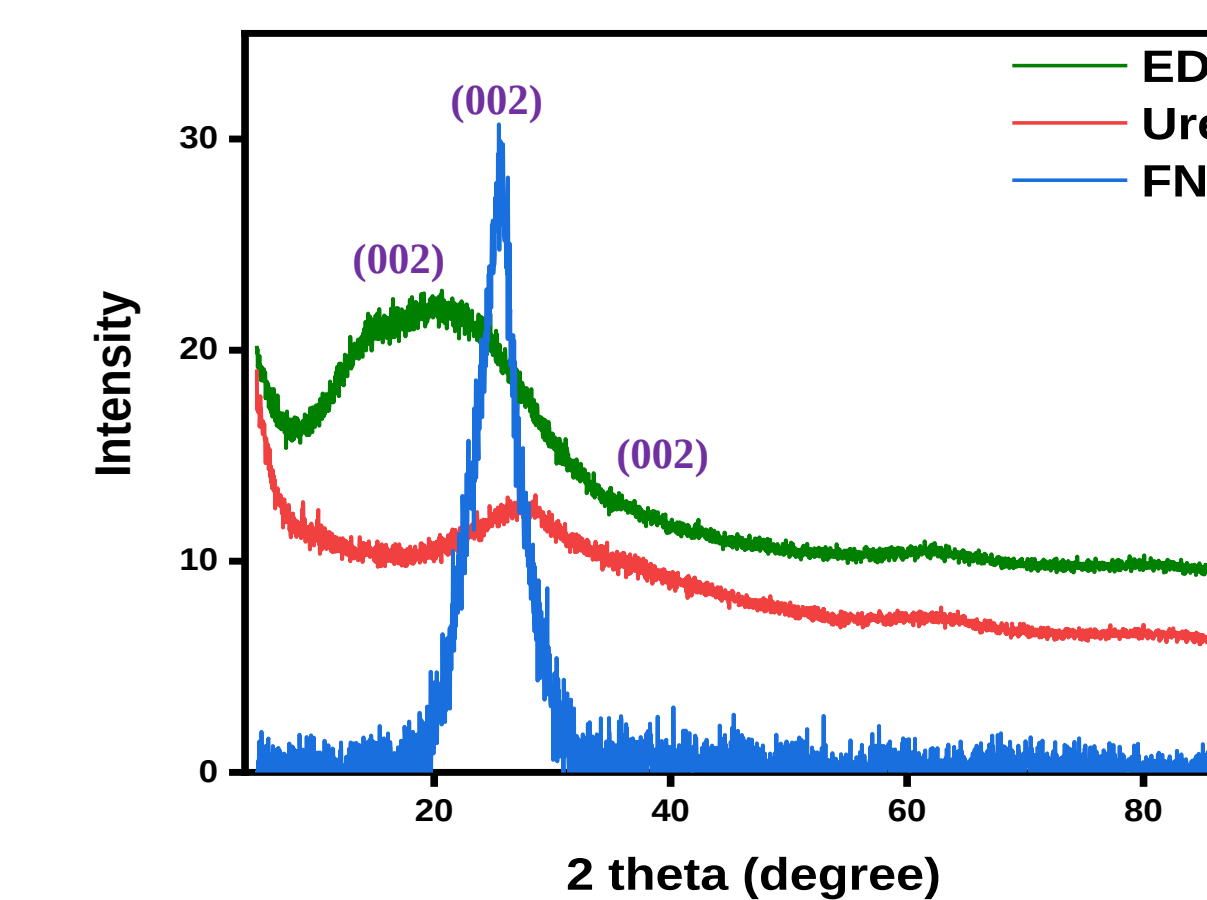
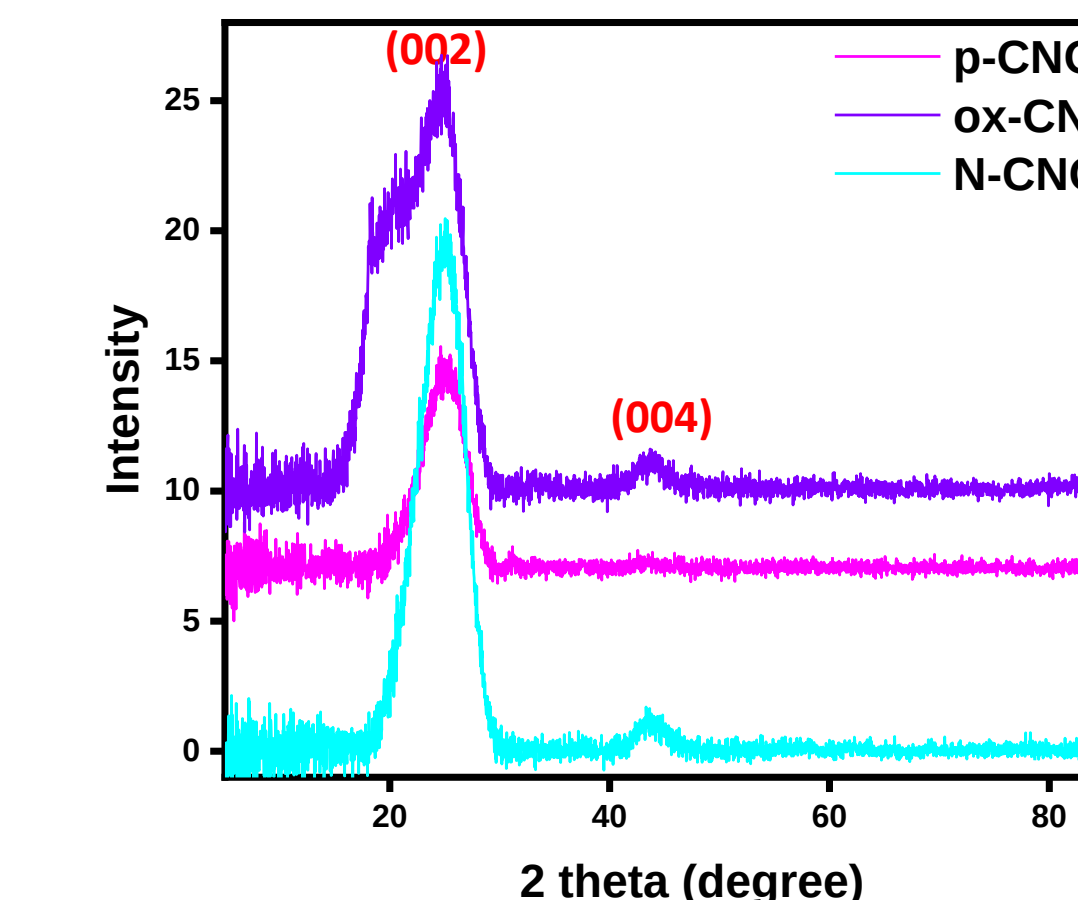


Figure 7: PXRD spectra of the N-Cdots (Left)

Figure 8: PXRD spectra of all the CNOs (Right)



ACKNOWLEDGEMENTS

