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## Structural, morphological and Raman scattering studies of carbon doped ZnO nanoparticles fabricated by pneumatic spray pyrolysis technique

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### Abstract

Zinc oxide (ZnO) nanoparticles (NPs) were prepared by pneumatic spray pyrolysis technique (PSP) using zinc ethoxide as a precursor and tetrabutylammonium as a dopant. The morphological, structural and optical properties of PSP synthesized un-doped and C-ZnO NPs were evaluated using SEM, XRD, HRTEM, RS and UV-vis spectroscopy. SEM analysis has revealed that as synthesized NPs have spherical shape and the morphology of the NPs change as the concentration of carbon increases. XRD analysis has revealed peaks at  $31.90^\circ$ ,  $34.50^\circ$ ,  $36.34^\circ$ ,  $47.73^\circ$ ,  $56.88^\circ$ ,  $63.04^\circ$ ,  $68.20^\circ$ , and  $77.33^\circ$  belonging to the hexagonal Wurtzite ZnO crystal structure. HRTEM analysis has revealed the presence of spherical NPs with a NP size of (8.65 nm), (10.11 nm), (12.38 nm) and (13.79 nm) for the un-doped ZnO, 0.01 M C-ZnO, 0.015 M C-ZnO, and 0.025 M C-ZnO NPs respectively. Moreover the Selected area diffraction images displaying the fact that only the diffraction planes of (101), (002) and (100) are responsible for the diffraction pattern. RS analysis has shown prominent peaks at  $434\text{ cm}^{-1}$  which is the characteristic peak of  $E_2^2$  (high) mode of the Wurtzite ZnO and the  $E_2^1(2)$  (high) has been red shifted by  $4\text{ cm}^{-1}$ , as compared to that found in the bulk ZnO. Raman phonon shifts in C-ZnO NPs are discussed in detail. The obtained results can be used for identification of phonons in Raman spectra of C-ZnO NPs.

**Apply to be considered for a student &nbsp; award (Yes / No)?**

yes

**Level for award &nbsp;(Hons, MSc, &nbsp; PhD, N/A)?**

MSc

**Main supervisor (name and email) and his / her institution**

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**Would you like to submit a short paper for the Conference Proceedings (Yes / No)?**

Yes

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