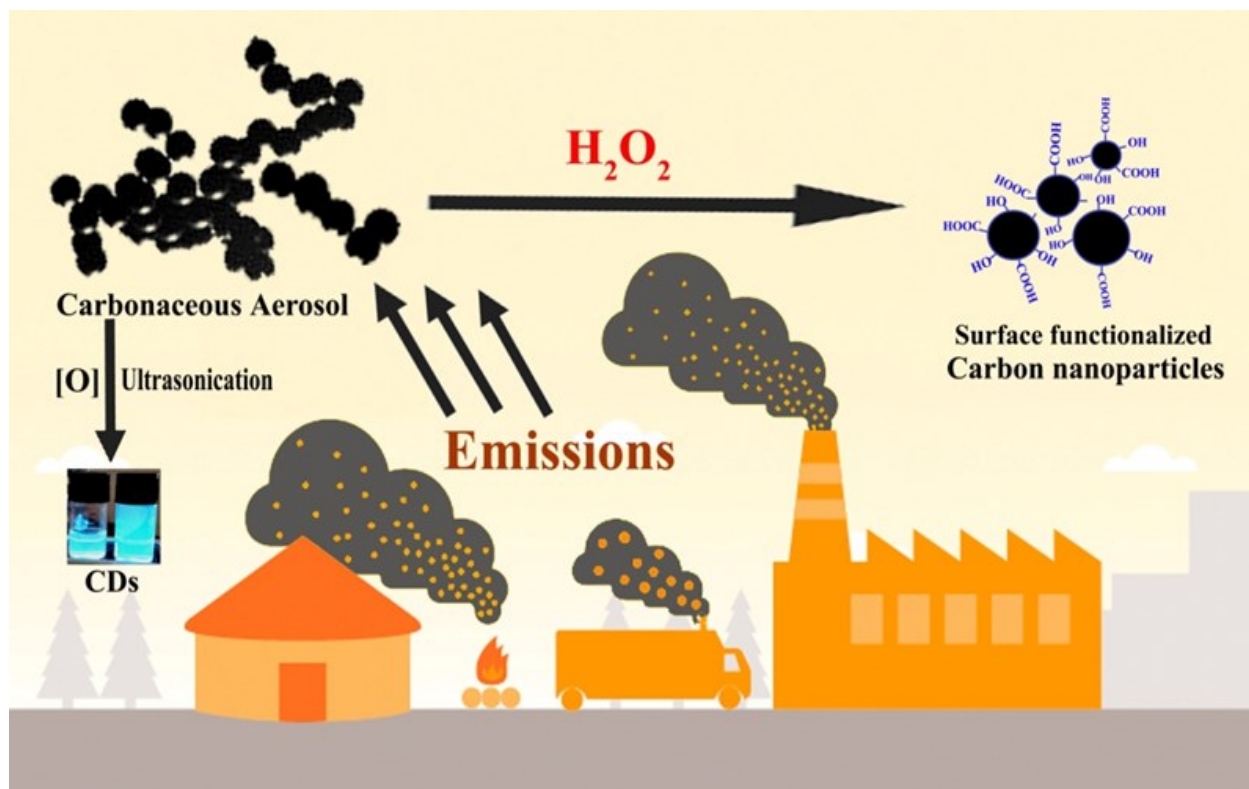


## Carbon nanodots from atmospheric carbonaceous aerosols

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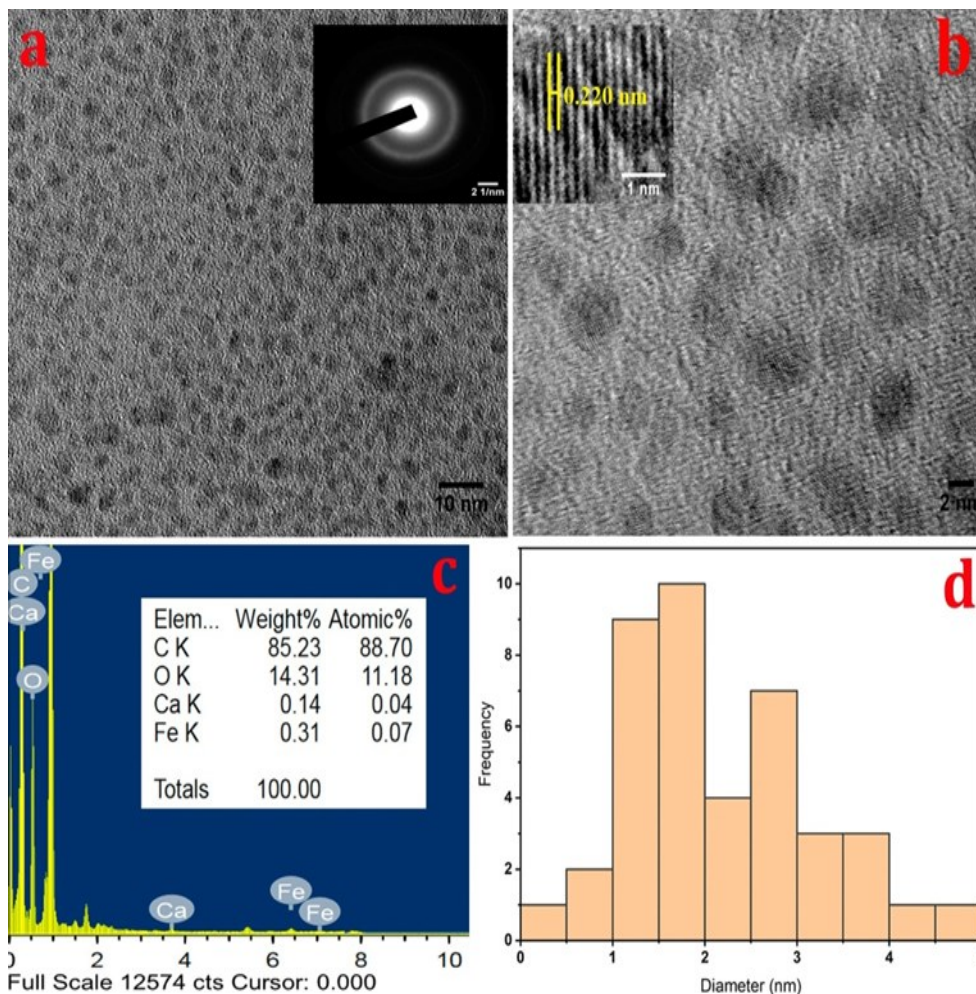
### Key highlights:

- Carbonaceous aerosols reveal presence of carbon-rich soot particles.
- The structure of the soot particles shows a disorganised core and outer graphitic layers.
- The soot particles on oxidation with  $H_2O_2$  followed by ultrasonication generate dispersed carbon nanoparticles.
- The carbon nanoparticles show good fluorescent property with blue emission under UV (360 nm) light.
- The properties of these carbon nanoparticles resemble with the engineered carbon nanoparticles such as carbon dots.

### Summary:

Carbonaceous aerosols play significant roles in air quality and the climate; their oxidation at the nano-scale level may possibly increase the reactivity and toxicity of atmospheric particulates. In the present study, a laboratory experiment on the atmospheric carbonaceous aerosol was done by using  $H_2O_2$  as an oxidizing agent. An extensive study made with advanced analytical tools revealed the formation of photoluminescent carbon nanoparticles (carbon nanodots) in the carbonaceous aerosol. The carbon nanoparticles are mostly at the  $sp^2$  hybridization state and contain various surface functional groups such as carboxyl and carbonyl groups. The properties of these carbon nanoparticles resemble the engineered carbon nanoparticles such as carbon dots (CDs).

(CDs). The carbon nanoparticles, mainly less than 10 nm, are composed of carbon nanocrystals containing a few other elements such as Ca and Fe. Fluorescence spectroscopy revealed the characteristic excitation-dependent emission spectra of blue fluorescent carbon nanoparticles. The results indicate the presence of characteristic carbon nanoparticles in the carbonaceous aerosol in PM<sub>10</sub>, opening a new perspective for the recovery of high-value carbon dots from an atmospheric aerosol and for predicting environmental processes occurring in the atmospheric environment.



### Major findings :

- The study shows formation of blue fluorescent carbon nanoparticles from atmospheric carbonaceous aerosols which provide a new avenue for recovery of high-value carbon nanomaterials.
- The presence of carbon nanoparticles with surface functional groups in carbonaceous aerosols might induces toxicity to the human health.
- The interaction of carbon nanoparticles with atmospheric H<sub>2</sub>O<sub>2</sub> may have significance on climate as oxidation influences the ice/cloud nucleation properties

## Research Article

### Citation

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