

## ***Abstract***

Carbon Nanodots (CNDs) as an emerging new class of carbon Nano-allotropes have several attractive properties such as; small size (less than 10 nm), good photoluminescence, low toxicity, excellent water solubility, etc. These outstanding features make CNDs good candidates in different fields and applications as sensors, photo catalysts, anticancer, antimicrobial, etc.

In this work, CNDs will be synthesized from used (smoked) tobacco molasses (the tobacco of nargileh) through extraction and chemical oxidation methods. The produced CNDs will be characterized by different techniques such as; UV-Vis, FT-IR, Fluorescence spectroscopy, AFM, XPS and Raman. It is intended to use these CNDs in environmental applications such as photo degradation of pollutant dyes or sensing of harmful elements and species.

As a result, two types of carbon nanodots have been synthesized from smoked tobacco molasses and named based on the method of synthesis: D-CNDs, which stands for direct extraction method, and O-CNDs. D-CNDs have a quantum yield of 1.55% and a wide range of particle sizes, with an average of 10.7 nm. While O-CNDs exhibit a higher quantum yield of 3.1% and a narrow range of particle size with an average of 2.7 nm. The outcome product yield is 71%, which is relatively high.

The synthesized CNDs have been used as sensing for ions in water based on fluorescence quenching. The CNDs were selective to  $\text{Fe}^{+3}$  compared to other ions such as ( $\text{Fe}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Hg}^{2+}$ ,  $\text{Ni}^{+2}$ , and  $\text{Pb}^{+2}$ ). Sensitivity and efficiency of both CNDs have been examined with regard to  $\text{Fe}^{+3}$  to find that O-CNDs have better-sensing results compared to D-CNDs due to their surface oxygenated groups and negative charge. In comparison O-CNDs sensing range (0-50)  $\mu\text{M}$ , sensitivity  $0.0045 \mu\text{M}^{-1}$ , LOD 3.9  $\mu\text{M}$ , LOQ 13  $\mu\text{M}$ , and efficiency of 76.6% at 400  $\mu\text{M}$  while D-CNDs have sensing range (0-50)  $\mu\text{M}$ , sensitivity  $0.0029 \mu\text{M}^{-1}$ , LOD 7.2  $\mu\text{M}$ , LOQ 24  $\mu\text{M}$ , and efficiency 65% at 400  $\mu\text{M}$ .