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Detection of carbon nanotubes in plant roots through microwave-induced heating FAHMIDA IRIN, Department of Chemical Engineering, Texas Tech University, BABINA SHRESTHA, JACLYN CANAS, The Institute of Environmental and Human Health, Texas Tech University, MOHAMMAD SAED, Department of Electrical and Computer Engineering, Texas Tech University, MICAH GREEN, Department of Chemical Engineering, Texas Tech University — We demonstrate a novel technique for quantitative detection of CNTs in biological samples by utilizing the thermal response of CNTs under microwave irradiation. In particular, rapid heating of CNTs due to microwave absorption was employed to quantify the amount of CNTs present in alfalfa plant roots. Alfalfa roots were prepared by injecting a known amount of CNTs (single walled and multi walled) and exposed to 30-50 W microwave power to generate calibration curves (temperature rise vs. CNT mass). These calibration curves serve as a characterization tool to determine the unknown amount of CNTs absorbed by alfalfa plant roots grown in CNT-laden soil with superior accuracy and sensitivity. Moreover, the threshold for detectable CNT concentration is much lower than common analytical methods of detecting nanomaterials, such as scanning electron microscopy (SEM), transmission electron microscopy (TEM), and Raman spectroscopy. Considering the lack of effective detection methods for CNT uptake in plants, this method is not only unique but also practical, as it addresses a major problem in the field of nanotoxicology risk assessment.

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