Spectroscopic Tracking of the Dissolved Organic Carbon (DOC) Conversion to Carbon Dioxide (CO_2) for Isotopic Analysis and Carbon Fate Tracking

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Dissolved Organic Carbon (DOC) quantification of isotopic ^{14}C and $\delta^{13}C$ using Accelerator Mass Spectrometry (AMS) and Isotope Ratio Mass Spectroscopy (IRMS) plays a critical role in understanding carbon cycling between terrestrial and aquatic ecosystems. Research studies over the past few decades have contributed to a deeper understanding of the carbon cycle and may suggest residence time of the organics in water when used as a relational tool to interpret hydrogeologic differences for water resource management in aquifers, groundwater dependent ecosystems, Blue Carbon ecosystems, and landfill leachates. However, accessing the DOC pool can be challenging due to the halogen ion (e.g. Cl^-, Br^-, Fl^-, etc.) species present in natural coastal waters. Here, we present spectroscopic tracking of the photomineralization of DOC using UV oxidation (UVox) from a medium pressure mercury lamp along a surface freshwater to marine water gradient collected in South Florida. The UVox photochemical conversion efficiency and real-time tracking of product CO_2 and CO gases using a halogen trap were determined via Ultraviolet-Visible (UV-Vis) and Cavity Ring Down Spectroscopies (CRDS). Additionally, a thermal stress test was conducted with two recommended bottle types and filters of different pore sizes. It confirmed that there was little variation between Nalgene HDPE and amber glass bottles, regardless of filter pore size, in how effectively they served as water storage containers without the risk of leaching or contaminating samples due to long-term heat stress. Such novel tools allow for a deeper understanding of coastal resilience and can be used in concert with other carbon species (CH_4, Dissolved Inorganic Carbon, and carbon bearing sediments) to predict and respond to disturbances in the carbon cycle that threaten the health of coastal ecosystems.