

2020 SACNAS — THE NATIONAL DIVERSITY IN STEM VIRTUAL CONFERENCE ABSTRACT BOOK

Student Poster Presentations

What Can the Variability of Hematite Tell Us about the Climate of the Triassic?

Discipline: Geoscience

Subdiscipline: Earth Science

Owen Yazzie*, Arizona State University; Christopher Lepre, Rutgers University and Paul Olsen, Columbia University

Abstract: Hematite is a common iron oxide found in mudstone layers and can display numerous colors. Experiments have determined that the color of hematite can be used as an indication of climate. Hematite appears redder in arid climates and bluer in humid climates. In addition, it can be determined where hematite particles may be much finer, as red hematite is smaller than blue hematite. Using diffuse reflectance spectroscopy, visible light concentrations from rocks, soils, and sediments can be collected. From the visible light data, hematite concentrations and its predominant red or blue color can be determined, based on the absorbance characteristics within the wavelength band of ~530-580 nm. For our study, a Varian Cary 50 spectrophotometer fitted with a diffuse reflectance spectroscopy sensor was used to collect diffuse light data from Late Triassic fossil soils preserved in sediment cores of the Chinle Formation, AZ. We conducted a meta-analysis of these data and compare the results to CIE color space data measured by the Geotek Multi-Sensor Core Logger at the national repository of LacCore, MN. Our preliminary results indicate that hematite concentrations in the younger half of the sediment core correlate to redder CIE color data, whereas color data for the older half appears to indicate bluish and/or purple hematite. These observations suggest that, similar to hematite concentration, color changes are indicating a progressive drying of the Late Triassic monsoon. Understanding Late Triassic climate provides insights into environmental conditions under which the major elements of modern animal communities on land first evolved.

Discipline: Chemistry

Subdiscipline: Analytical Chemistry

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Abstract: Aromatic aldehydes are widely used as solvents, flavoring materials in foodstuffs, fragrances and as precursors in the organic synthesis of a plethora of compounds. The percentage of these compounds in commercial products must be rigorously controlled due to their reactivity and toxicity. Several analytical methods for aromatic aldehydes detection have been reported, but some disadvantages such as high cost, unavailability, toxicity, and time-consuming are encountered. We present the development a simple, fast and sensitive chromogenic and fluorogenic assay with a low-cost for the detection of aromatic aldehydes at nanomolar concentrations. The assay involves the reaction between benzamidine and glyoxal bisulfite. The so formed intermediate undergoes to aldolic condensation with aromatic aldehydes leading to a fluorescent benzyl imidazolone. The method was optimized with structurally different aromatic aldehydes to detect them between 0.2 and 100 μM in aqueous solution. The fluorophores were characterized by NMR, UV-VIS and fluorescence spectroscopy. The same reaction was carried out in solid phase using benzamidine linked to cellulose paper strip. For the sensitivity of the calibration curve, the limit of detection was 79 nM. This work is the first example of the use of the glyoxal reaction as an assay for the detection of aromatic aldehydes and discusses its application for the development of paper strip fluorescent assays.

Exploring Different Capillary Coatings in Capillary Isoelectric Focusing to Detect Blood Doping