Contribution ID: **42** Type: **Oral**

Simultaneous detection of Sunset Yellow and Tartrazine using Al_2O_3 modified nanoparticles via Enhanced Carbon Paste Electrodes

Al_2O_3 nano metal oxide was prepared using the solution combustion method, and its properties were characterized with X-ray Diffraction, Scanning Electron Microscopy, and Energy Dispersive X-ray Analysis. This work involves fabricating electrochemical sensors with Al_2O_3 via carbon paste electrodes for the simultaneous detection of Sunset Yellow (SY) and Tartrazine (TZ), two major synthetic food dyes. Excessive consumption of SY and TZ can potentially be carcinogenic beyond the recommended daily intake. The Al_2O_3-modified electrode shows excellent sensitivity toward SY and TZ compared to a bare electrode. Cyclic voltammetry and differential pulse voltammetry (DPV) techniques were used to explore the electrochemical properties of SY and TZ. The pH and scan rate studies were conducted to determine the electron transfer number and the type of electrode process, respectively. The limits of detection (LOD) and quantification (LOQ) for SY were 0.103 µM and 0.346 µM, respectively; for TZ, they were 0.705 µM and 2.352 µM. The prepared electrode demonstrated 73% reproducibility for Sunset Yellow and 90% reproducibility for Tartrazine over 20 cycles.
Keywords: Aluminum oxide, combustion, sunset yellow, tartrazine, simultaneous.

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Track Classification: Chemical Sciences