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Investigation of using wavelet analysis for classifying pattern of cyclic voltammetry signals

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Wavelet analysis is an excellent technique for data processing analysis based on linear vector algebra since it has an ability to perform local analysis and is able to analyze an unspecific localized area of a large signal. In this work, the wavelet analysis of cyclic waveform was investigated in order to find the distingue feature from the cyclic data. The analyzed wavelet coefficients were proposed to be used as selected cyclic feature parameters. The cyclic voltammogram (CV) of different electrodes consisting of carbon nanotube (CNT) and several types of metal phthalocyanine (MPc) including CoPc, FePc, ZnPc and MnPc powders was used as several sets of cyclic data for various types of coffee. The mixture powder was embedded in a hollow Teflon rod and used as working electrodes. Electrochemical response of the fabricated electrodes in Robusta, Arabica, blend coffee and cocoa at varied concentrations was measured with scanning rate of 0.05V/s from -1.5 to 1.5V respectively to Ag/AgCl electrode for five scanning loops. The CV of blended CNT electrode with some MPc indicated the ionic interaction which can be the effect of catalytic oxidation of saccharides and/or polyphenol on the sensor surface. The major information of CV response can be extracted by using wavelet analysis with Harr mother wavelet and then the discrimination of these wavelet coefficients of each data group can be separated by principal component analysis (PCA). The PCA results indicated the clearly separate groups with total contribution more than 90% representing from PC1 and PC2.

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