CAPSULES
preliminary notes and applications from Bioanalytical Systems, Inc.

Determination of Food Colors in Corks

Purpose

Food colors must be added to corks to restore the color that is lost during manufacturing. The most widely used food coloring used for this purpose is Sunset Yellow FCF (known in the U.S. as FD&C Yellow 6) (F1a); however, Orange II (known in the U.S. as D&C Orange 4) (F1b) is also used, although its use as a food color is not permitted. Hence, there is a need for a method to distinguish between these two food colors. However, it can be seen from F1 that their molecular structures are similar, which makes their differentiation more difficult.

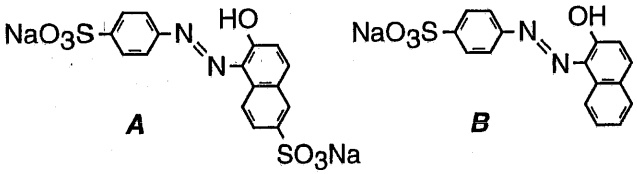

Figure 1. Structure of (A) Sunset Yellow FCF and (B) Orange II.

Reference

Polarographic Identification and Determination of Synthetic Coloring Matter in Corks, A.A. Barros and J.A.M. Rodrigues, Electroanalysis 3 (1991) 243-245.

Method

The redox potentials of the two food colors are very similar over a wide range of pH values. However, differentiation was possible following the addition of tetraphenylphosphonium chloride (TPPC) and sodium hydroxide (NaOH), which alters the peak currents and peak potentials. Differential pulse polarography was the electrochemical method used in this analysis, since the discrimination against the charging current that is inherent in this technique leads to favorable detection limits (< 100 ppb).

Results

The differential pulse polarograms of a mixture of the two food colors (1 ppm) in the presence of TPPC (250 ppm) with various concentrations of NaOH is shown in F2. It is apparent that increasing the concentration of NaOH leads to a separation of the two peaks.

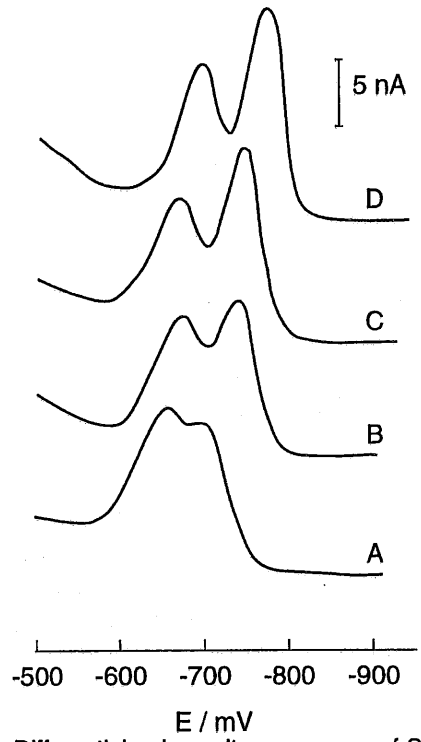

Figure 2. Differential pulse voltammograms of Sunset Yellow (1ppm), Orange II (1ppb) and TPPC (250 ppm) in NaOH solution: (A) 0.002 M (B) 0.005 M (C) 0.010 M and (D) 0.050 M. Figure adapted from reference.

This method was used to analyze the food colors added to four batches of corks using the method of standard additions to quantitate the concentrations. The results are shown in T1.

Table 1. Determination of food colors in cork batches

Cork Batch	Identified Food Color	Amount detected (µg / cork)
1	*Orange II*	*37*
2	*Sunset Yellow FCF*	*5*
3	*Orange II*	*15*
4	*Sunset Yellow II*	*6*