AccuTOF™

Sudan Dyes Analysis by AccuTOF™ LC/MS System

Zhanpin Wu, JEOL USA, Inc.

Introduction

Sudan dyes are red dyes that are used for coloring solvents, oils, waxes, petrol, and shoe and floor polishes. They are considered to be carcinogens and teratogens. Due to this fact, the US and the EU do not permit the use of these colors as food additives. However, in some countries, these dyes are still occasionally used in order to intensify the color of bell pepper and chili powders. Here, we describe a simple LC/TOF-MS method for sudan dyes I, II, III, and IV analysis.

Experimental

All solvents used are of HPLC grade. Sudan dyes standards were prepared in methanol. The system consisted of an Agilent 1100 HPLC and JEOL AccuTOF™ time-of-flight mass spectrometer. The HPLC conditions and MS conditions are listed in Table 1 and Table 2, respectively.

Table 1 HPLC Conditions

Column	Phenomenex 3 µ Luna C18 (2), 100 x 2 mm, 3µm
Mobile Phase	A: 0.1% formic acid; B: methanol
Flow Rate	0.2 mL/min
Gradient	From 90% B to 100% B in 10 min and held for 5 min

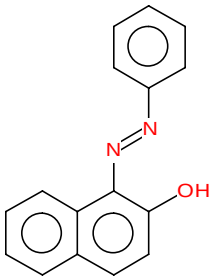
Table 2 MS Conditions

Source	ESI	Ionization Mode	positive
Needle Voltage	2000 V	Ring Lens Voltage	4 V
Orifice 1 Voltage	35 V, 65 V	Ion Guide Voltage	1850 V
Orifice 2 Voltage	9 V	MCP Voltage	2600 V
Orifice 1 Temperature	80 ºC	Nebulizing Gas	2 unit
Desolvating Temperature	200 ºC	Desolvating Gas	1 unit

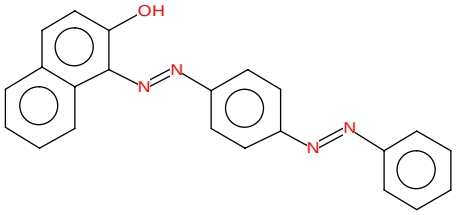
Results

Figure 1 shows the structures of sudan dyes I, II, III, and IV. Figure 2 shows the mass chromatogram of the dyes obtained using the AccuTOF LC/MS. The separation is excellent. The run time is only 15 min. Orifice 1 voltage was alternatively switched between 35 and 65 V in order to achieve best detection sensitivity for all sudan dyes. A signal to noise ratio of 100 was achieved when 6.25 ng/mL sudan IV solution was injected into the system. Accurate mass

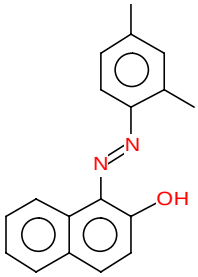
measurements were performed to identify sudan dye components by using post-column injection of 100 ng/mL Nortriptyline solution as internal reference. The mass errors were within 2 mmu, illustrating excellent mass accuracy. This method is easy, simple, and quick.



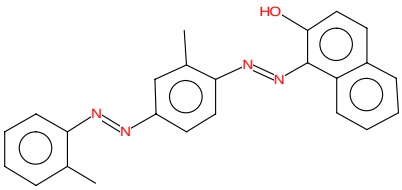
Sudan I



Sudan III



Sudan II



Sudan IV

Figure 1. Structures of Sudan Dyes I, II, III, and IV.

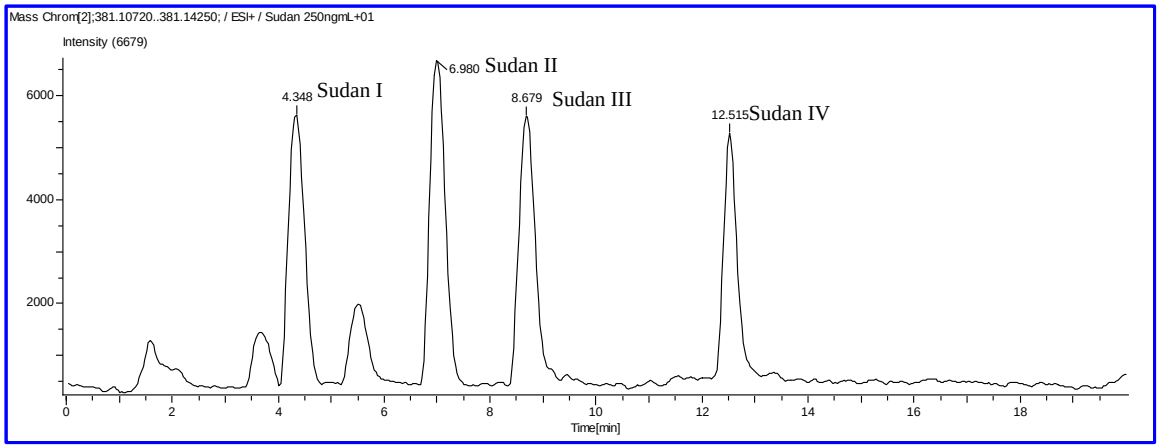


Figure 2. Mass Chromatogram of Sudan Dyes