FLUORESCENCE APPLICATIONS

CONSTANT ENERGY SYNCHRONOUS LUMINESCENCE SPECTROSCOPY USING THE MODEL LS-50 LUMINESCENCE SPECTROMETER

ABSTRACT

Qualitative analysis of polynuclear aromatic hydrocarbon mixtures by constant energy synchronous luminescence (CESL) has been performed using the Model LS-50 Luminescence Spectrometer (L225-0105).

INTRODUCTION

Constant wavelength synchronous luminescence (CWSL) spectroscopy is a well established method for increasing spectral selectivity where the samples under analysis are very complex (1). Typical applications include crude oil, pharmaceutical and polynuclear aromatic hydrocarbon analyses (2,3,4).

The technique involves scanning both monochromators simultaneously with a constant wavelength difference: this works adequately in practice although with very complex samples the enhancement of spectral resolution is limited.

A more recent development in synchronous luminescence describes the use of a constant energy difference between the two monochromators: this gives better rejection of background fluorescence and greater spectral selectivity than CWSL (5).

CESL analysis of a three-component mixture and of crude oils has been carried out using the LS-50 Luminescence Spectrometer.

Significant benefits over CWSL were observed in both cases.

MATERIALS

n-Heptane (glass distilled grade) was obtained from Aldrich Chemical Company, Dorset, UK.

Individual PAH stock solutions were prepared by dissolving 1 mg each of anthracene, coronene and perylene in 10 mL of n-heptane.

Working PAH solutions were prepared by serial dilution of stock solutions in n-heptane to give a final concentration of 10 ng/mL.

Working solution crude oil solution was prepared by 30,000-fold dilution of Iranian crude in n-heptane.

METHOD

CWSL and CESL spectra were collected using the following conditions:

- **Spectral range**: 250-500 nm
- **Slits (Ex/Em)**: 5/5 nm
- **Scanspeed**: 120 nm/min
- **Delta (CESL)**: -1600/cm, -3000/cm
- **(CWSL)**: 15 nm
RESULTS

Figures 1a), 1b) and 1c) show the CESL spectra for anthracene, coronene and perylene at the two frequency intervals.

Figure 2 shows overlayed spectra of the mixture scanned at constant energy and constant wavelength. Although only three components were present in the sample, only perylene was specifically identifiable using CWSL. Two specific spectral peaks could be attributed to each component using CESL.

The CESL and CWSL spectra for Iranian crude oil in n-heptane are shown in Figure 3. Considerably higher spectral selectivity is produced by CESL.
REFERENCES