



**Figure 3** TLC chromatograms corresponding to saturate fractions determined using fluorescence scanning densitometry on berberine-impregnated silica gel plates (lightweight lines) and aromatic fractions determined using UV scanning densitometry on the same plates (heavy lines). (A) Heavy oil; (B) visbreaking fuel, (C) lubricant, (D) gas oil. Copyright 1999 Preston Publications. (From Ref. 14.)

the saturated fraction of the bitumen. According to the authors, qualitative identification of bitumens of different grades and/or from different refineries is possible with this technique.

## 2. Environmental Sciences, Toxicology, and Health

Hydrocarbons, especially PAHs, are ubiquitous environmental contaminants. In general, PACs enter the environment primarily as by-products of incomplete combustion from a wide variety of sources. Because some PACs are known or suspected to be animal carcinogens, there is considerable interest in the detection of their presence, concentration, and distribution in the environment. Their analysis by TLC was reviewed in 1996 by Bladek (63) in a study concerned with the application of TLC to environmental analysis.

All environmental samples (from water, air, soil and food) require a previous step of sample preparation or cleanup before analysis by TLC. This step depends on sample origin. This aspect is not considered in this chapter.

*a. Water and Marine Samples.* With regard to environmental applications to marine samples, on-line coupled HPLC-TLC with two-dimensional development has been used for PAH characterization in sediments (64). Reversed phase on  $C_{18}$  bonded silica and acetylated cellulose were used. Developing solvents were methanol–diethyl ether–water. The second dimension of elution resolved the aromatic compounds satisfactorily. PAH peaks were detected by fluorescence densitometry.

Prediction of *n*-octanol–water coefficients and related biological activities was attempted through quantitative structure–activity relationships obtained from  $R_f$  data of polynuclear parent and heteroatomic hydrocarbons, which were in turn obtained on  $C_{18}$  reversed-phase TLC plates (65). Elution was carried out with methanol–deionized water–phosphate buffer, and detection was done by UV (254 and 350 nm).

A good example of direct application of a method developed with standards is the previously cited work by Funk et al. (35) (see Sec. IV.A.3.b), in which silica gel HPTLC plates were im-