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Analytical Method for Discrimination of Illegal Gas Oil Prepared from Fuel Oil Mixed with Sulfuric Acid

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Illegal gas oils, prepared by mixing fuel oils with sulfuric acid, were analyzed by spectrofluorophotometry and gas chromatography mass spectrometry (GCMS). The spectrofluorophotometric studies showed that both the excitation wavelength and emission wavelength at the maximum fluorescent peak of the illegal gas oils were blue-shifted to similar wavelengths to those of gas oils. The illegal gas oils could be discriminated by the contour plots of the three-dimensional fluorescent spectra and the peak shapes of the excitation and emission spectra. The GCMS analysis showed that aromatic compounds were removed from the fuel oil with increasing mixing time with H₂SO₄. The mixing treatment with H₂SO₄ could not effectively remove non-condensed polycyclic aromatic compounds such as alkyl benzene and biphenyl from the fuel oil in contrast to the condensed polycyclic aromatic compounds such as naphthalene and phenanthrene. As a result, the fuel oil was transformed to illegal gas oil containing abundant saturated hydrocarbons. Although fuel oil moderately mixed with 95% H₂SO₄ (1 : 1) for 3 min closely resembled the component of gas oil, the modified fuel oil could be discriminated from gas oil by the peak intensity ratios of the molecular ion of 1,2,4-trimethylbenzene to the ion of pentadecane. Accordingly, spectrofluorophotometry and GCMS analyses were very useful for the discrimination of illegal gas oils prepared by mixing fuel oils with H₂SO₄.

Keywords: [Fuel oil](#), [Illegal gas oil](#), [Sulfuric acid](#), [Aromatic compound](#), [GCMS](#), [Spectrofluorophotometry](#)

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