The comparison of the oil pollution results in the sea water by two different UVF apparatus

İki değişik UVF aletinde petrol kirliliği sonuçlarının mukayesesi

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Abstract

In this work was discussed the results of obtained by two different apparatus as Shimadzu RF 1501 and Jasco FP 6300. The measurements of oil pollution level in the sea waters were determined by using references of the Russian and Iraq crude oils and chrysene. It was found some differences between the results obtained by two apparatus. The error in the results of the references are in Russian crude oil between 0.1-4.4%, in Iraq crude oil 2% and in chrysene sample 5.8%. Based on these results it was suggested that the measurements must be made by the same apparatus.

Keywords: UVF, apparatus, Shimadzu, Jasco.

Introduction

The fluorescence spectroscopic method is a rapid and cheap screening technique and has excellent sensitivity in determining fluorescent compounds in pharmaceutical, biomedical and environmental samples such as sea water. Spectrofluorometry is based on the assumption that the fluorescence intensity in a sample is quantitatively related to its standard (Mzoughi et al. 2005). Fluorescence analysis is very sensitive for single aromatic compounds. Different numbers of fused aromatic rings exhibit their maximum emission of particular wavelength. Ultraviolet fluorescence (UVF) analyses are possible only the sample and standard have the same aromatic composition.

The fluorescence has a tendency for some molecules to absorb radiation in the ultraviolet or visible regions of the spectrum and then to emit radiations usually at longer wavelengths. In other word fluorescence term is used to describe the emission which accompanies a transition from a higher to a lower electronic state (Hamilton 1960). The molecule is excited (ex) into a state of higher energy and the measurement is made from the emission (em) produced.

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The equation given indicates that the intensity of fluorescence depends upon on the exciting light (Hamilton 1960). The fluorescence intensity should be directly proportional of the
fluorescing species. The limit of detection for many compounds assuming carefully purified solvents and reagents is frequently in the vicinity of from 0.1 to 0.001 µg/ml.

The sensitivity of instrument is an important point. In general, measurements were made on the same instrument (LAW 1981). It is recommended for the measurement, the wavelength and for the intensity (ex/em) must be determined for the specimens substances before the analysis (Gezgin 2005). The errors are more serious if the compound analyzed is not pure.

There is not any direct comparison of the results obtained from different instruments. In this work the results of two different instruments were compared.

Material and Methods

Sample: Sea water collected from Golden Horn (Stations B1, B2, B3) and Sea of Marmara (Stations M8, M11).

References: Seven Russian crude oils imported by TÜPRAŞ İzmit Refinery, three samples from Botaş (Iraq oil) and chrysene (Merck).

Stock solutions were prepared as 100 µg in 100 ml hexane.

Standard curve: The concentrations of the references were prepared, seven Russian crude oil standards (0.25, 0.50, 1.00 µg/ml), three Iraq oils (0.25, 0.50, 1.00, 2.00 µg/ml) and chrysene (0.05, 0.10, 0.15, 0.20, 0.25 µg/ml).


Solvent and chemical compounds were used Merck (Darmstadt Germany Product).

Extraction of oil from sea water (Law 1981, UNESCO 1984, Kelly et al. 2005, Mzoughi et al. 2005): 800 ml sea sample was extracted three times with 20 ml dichloromethane (DCM), the extracts were collected and dried over anhydrous sodium sulfate, filtered and distilled. The residue was taken with hexane and the volume was adjusted to 10 ml and their intensity was measured by two apparatus at 310/360 nm (ex/em).

Results

Standard curves equations and their mean equations of seven Russian and three Iraq crude oil samples and chrysene are shown in Table 1.
The analyses results of the sea water

The comparison of the results through Russian crude oil obtained from Shimadzu RF 1501 and Jasco FP 6300 spectrophotometer in sea water samples are shown in Table 2.

Table 2. The results of the sea water samples by two apparatus through Russian crude oil (µg/L)

<table>
<thead>
<tr>
<th>Samples</th>
<th>Apparatus</th>
<th>Difference</th>
<th>Error%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shimadzu</td>
<td>Jasco</td>
<td></td>
</tr>
<tr>
<td>Golden Horn B1</td>
<td>543.06</td>
<td>542.07</td>
<td>0.99</td>
</tr>
<tr>
<td>Golden Horn B2</td>
<td>86.81</td>
<td>82.96</td>
<td>3.85</td>
</tr>
<tr>
<td>Golden Horn B3</td>
<td>76.64</td>
<td>77.03</td>
<td>0.39</td>
</tr>
<tr>
<td>M11</td>
<td>207.69</td>
<td>210.52</td>
<td>2.83</td>
</tr>
</tbody>
</table>

The comparison of the results obtained from sea water samples by iraq crude oil using two apparatus are shown in Table 3.

Table 3. The results of the sea water samples by two apparatus through Iraq crude oil (µg/L)

<table>
<thead>
<tr>
<th>Samples</th>
<th>Apparatus</th>
<th>Difference</th>
<th>Error%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shimadzu</td>
<td>Jasco</td>
<td></td>
</tr>
<tr>
<td>M8 10 m</td>
<td>21.21</td>
<td>20.65</td>
<td>0.44</td>
</tr>
</tbody>
</table>

The results obtained through chrysene references (0.12 µg/ml) are as follows:
Shimadzu RF 1501 
Jasco FP 6300

The difference between the results for the chrysene sample measured by two apparatus is 0.007 μg/ml and error is 5.83%.

Conclusion

It was found that some differences on the results obtained by two different UVF apparatus. The error in the results of the references are in Russian crude oil between 01-4.4%, in Iraq crude oil 2% and in chrysene sample 5.8%. These errors are based on the intensity of the compounds, plotting the standard curves, crude oil types, and concentration of the samples (Mazoughi et al. 2005). International limit of standard error for quantitative resultts is 10%. The errors calculated in this work are not serious from the quantitative point. In spite of these results it is better to use the same apparatus for the determination of aromatic hydrocarbons (Law 1981).

Özet

Bu çalışmada iki UVF aletinde örneklerin ölçümü sonunda alınan sonuçlar tartışıldı. Örnek olarak, Haliç, Marmara deniz suyu ve krizen maddesi kullanıldı. Her iki alette yapılan ölçümler sonucunda deniz suyunda 00.1-4.4, krizen örneğinde ise %2 fark bulundu. Bu sonuçlar dikkate alınarak devamlı çalışmalarında ölçümlerin aynı UVF aletinde yapılması önerilmiştir.

References


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