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Study of hydrocarbon composition petroleum fractions and evaluation of crude oil at Iraq (east Iraq) and produce diesel fuel

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Abstract

In this paper the Iraqi crude oil (east Iraq) from the field was studied for the production of disel fuels, therefore the purpose of this work was to study the potential of this oil for the production of diesel fuel (east Iraq) The higher the Quality of the raw materials for the production of fuels, the lower the costs for its processing will be required. Of greatest interest for these purposes is the fraction boiling away at a temperature of 200-350 ºC. And the relative amount of sulfur content present in the distilled fractions of crude oil at the boiling point of crude oil and of individual and group hydrocarbon composition of diesel fraction of oil of Iraq.

Keywords: crude oil, east Iraq, fuels, sulfur content, diesel fuel, Hydrocarbon.

1. Introduction

Petroleum is a naturally mixture of hydrocarbons, generally in the liquid state, that may also include compounds of sulfur, nitrogen, oxygen, and metals and other elements [1]. Crude oils are highly valued because they are feedstocks for a wide variety of products, including gasoline, diesel fuel, lubricant oil, hydraulic oil, and liquefied petroleum gas. Many properties of crude oil are dependent on their source [2].Crude oil or petroleum representing several classes of compounds, the most important of these being alkanes, naphthenes and aromatics [3]. These classes are not sharply divided as the aromatic compounds often contain alkane substituents and many of the ring structures are mixed aromatics and naphthenes. They also have heterocyclic compounds of oxygen, sulfur, nitrogen, phosphorus and trace amounts of metals especially vanadium, nickel and iron. These constituents may significantly affect the refining processes as well as the analysis procedures [4]. Oils with low carbon, high hydrogen, and high API (American Petroleum Institute) gravity are usually rich in paraffins and tend to yield greater proportions of gasoline and light petroleum products; those with high carbon, low hydrogen, and low API gravities are usually rich in aromatics. The former category is known as light crudes and the latter as heavy crudes [5]. The weight foundation the thermal cracking was initially invented to demonstrate properties of heavy oils, for the extremely paraffin-based oils [6]. Sulfur compounds can be inorganic compounds that affect the quality of the crude oil, that are most importantly are the ones that increase as the oil density [7].By using the pseudocomponent method for petroleum fluids, the lighter components (for example C1 to C6) are analytically identified and the heavier parts (in this case C7+ fractions) are empirically split into a number of fractions that each is characterized by one or more average properties[8]. On the other hand, some highly complex petroleum fluids contain various families of compounds such as paraffinic, olefinic, naphtenic and aromatic hydrocarbons for which application of the pseudocomponent method would require specification of a very large number of components[9]. Thus, accurate phase equilibrium calculation of such complex mixtures by using this approach would demand a great deal of time[10]. In addition, the method of selecting the components and calculation of their compositions and properties is quite sensitive on the results of the calculations[11].

Since crude oils is a multicomponent continuous mixture of hydrocarbons and heteroatomic compounds, conventional distillation methods cannot separate them into individual compounds with strictly defined physical constants, in particular the boiling point at a given pressure.It is customary to separate crude oils and crude oils products by distillation into separate components, each of which is a less complex mixture. Such components are called fractions or distillates. In laboratory or industrial distillation conditions, individual petroleum fractions are distilled off at a constantly increasing boiling point. Consequently, oil and its

fractions are characterized not by the boiling point, but by the temperature limits of the beginning of boiling and the end of boiling[12].

Crude Oils from different fields differ significantly in fractional composition and, consequently, in the potential content of distillates for motor fuel and lubricating oils. Most oils contain 10–30% gasoline fractions boiling up to 200 ° C and 40–65% kerosene-gas oil fractions distilling up to 350 ° C. There are known deposits of light oils with a high content of light fractions (up to 350 ° C). Thus, Samotlor crude oils contains 58% of light fractions, and gas condensates of most fields almost entirely (85–90%) consist of light fractions[13].

Sulfur, mainly in the form of sulfur compounds, is present in all oils, but its content varies widely. Low-sulfur oil is characterized by sulfur content from hundredths of a percent to 0.5%; medium-sulfur - from 0.5 to 1%; sulfurous - from 1 to 3%. Oils with a sulfur content of more than 3% are considered to be high-sulfur oils. It was found that sulfur in oil is in the form of free sulfur, hydrogen sulfide and organic sulfur-containing compounds of divalent sulfur: mercaptans, sulfides and polysulfides, thiophanes, thiophenes, etc[14].

Other distillate petroleum products. The essence of the method is that the test sample is placed in a beam of rays emitted by an X-ray source. The characteristics of the excitation energy from X-ray radiation are measured and the obtained signal from the pulse counter is compared with the counter signals obtained by testing the previously prepared calibration samples[15].

2. Experimental

2.1 Determining the fractional composition of oil and petroleum products by the method of distillation.

The following equipment was used to study the fractional composition: a distillation unit, flasks, thermometers, graduated cylinders, and technical scales. The distillation setup shown in About 200 g is loaded into the flask oil product, water is fed into the refrigerator and the heating of the distillation flasks. When the vapor temperature reaches 150 ºC from the refrigerator release water without interrupting the experiment. After distilling light distillates determine the mass of the residue in the flask. Populate the table and data is drawn up in the form of a graph in the coordinates "Boiling point of the fraction.

2.2 **Determining the density of crude oil products using a** pycnometer.

Crude oil viscosity is a significant physical characteristic that regulates and affect oil flux through pipes and porous media. Generally, viscosity is known as the fluid resistance to flow The apparatus used to evaluate viscosity is the viscometer, (U-tube viscometer) which is a device used to calculate liquid viscosity. (Table 2.)

2.3 Sulfur content and fractional composition of crude oil (east Iraq).

One of the most important characteristics of petroleum products during their processing is the sulfur content. The types of sulphur components in the crude oil are (Hydrogen Sulphide, Mercaptance, Sulphides) Crudes are classed as sweet or sour depending on their sulfur content This is due to the fact that deep processing of oil and oil products is carried out using various catalytic systems, for which sulfur-containing compounds are poisons and lead to rapid deactivation. Sulfur content is also tightly controlled in motor fuels. Most of Iraq's oils are sulphurous oils. Therefore, the sulfur content in the study of the potential of Iraqi oil for the production of motor fuels is an important characteristic.In this section, we investigated the change in the sulfur content in fractions boiling away at different temperatures. Sulfur was determined by energy dispersive X-ray fluorescence spectroscopy **.**Crude oil naturally contains sulfur compounds. Also identified hydrocarbon composition in the chromatographic separation of vapors of the diesel fraction of Iraqi (east iraq).

3.Discussion of results.

3.1 Sulfur content and fractional composition of crude oil (east Iraq).

The curve of the oil under study corresponds to a uniformly boiling mixture . The largest amount of the fraction boils away at a temperature of 240-350 ºC. Distillate yield boiling up to 350 ºC is 30-40%.

The resulting distillate was additionally fractionated into fractions (Table1.) and the dependence of the relative amount of the diesel fraction on the boiling point was plotted. Experimental data of distillation of diesel fraction 240-350 ºC (standard deviation not more than 0.2%) is described by the equation of the fourth order:

The obtained dependence was used to calculate the fractional composition of the diesel fraction, and its main indicators during distillation (Fig1.). According to the data obtained, the diesel fraction of the investigated oil is closest to other crude oils in Iraq.

Table 1. Total amount of diesel fraction Fuel(g) of (east iraq).

Boiling point of the fraction, °C	Amount of fraction, (g)	Amount of fraction,%	Sulfur content in the fraction, (g)
200	14.8	9.89	0.309
210	15.4	10.29	0.339
220	16.4	10.96	0.372
230	17.6	11.76	0.419
240	19.02	12.71	0.464
250	20.2	13.50	0.586
260	21.4	14.30	0.685
270	22.6	15.10	0.768
280	23.8	15.91	0.857
290	25.6	17.11	0.973
300	27.5	18.38	1.128
310	29.8	19.92	1.311
320	32.6	21.79	1.500
330	35.02	23.41	1.716
340	37.6	25.13	1.955
350	39.4	26.33	2.167

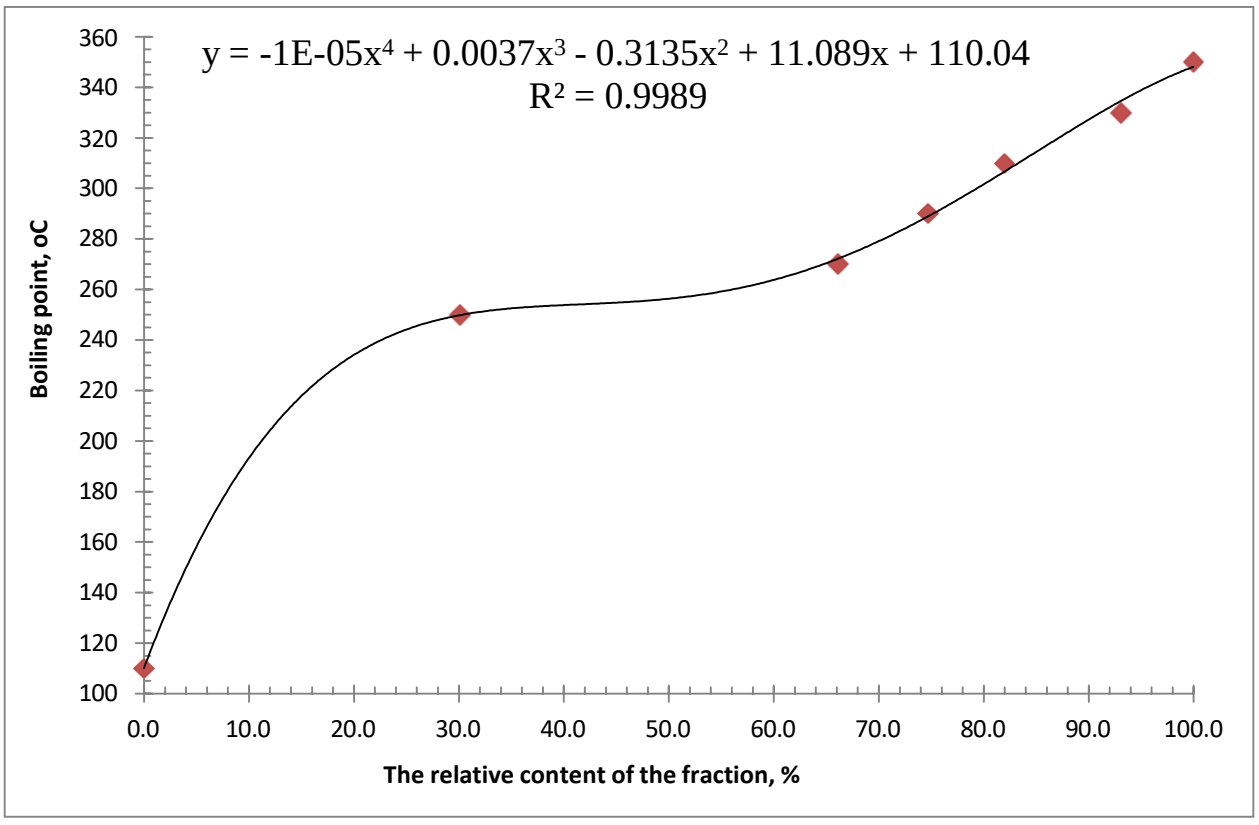

Figure 1. Fractional composition of the diesel fraction boiling at a temperature of 200-350 °C.

3.2 For the technology of oil refining, when calculating pipelines, tanks and other devices for storing and pumping oil products, the temperature dependence of viscosity and density is of great importance, therefore, in this section, we investigated the effect of temperature on the change in density and viscosity of the diesel fraction. As shown in(Table2., Fig2.)

The temperature dependence of the change in the density of the diesel fraction of the oil under study is well described by the first-order equation .

Table 2. Kinematic viscosity with time and temperature

Temperature °C	Time, S	Kinematic viscosity, mm^2 / s
25	700	7.35
30	620	6.510
35	540	5.670
40	490	5.145
45	440	4.620
50	380	3.990
55	310	3.255
60	260	2.730

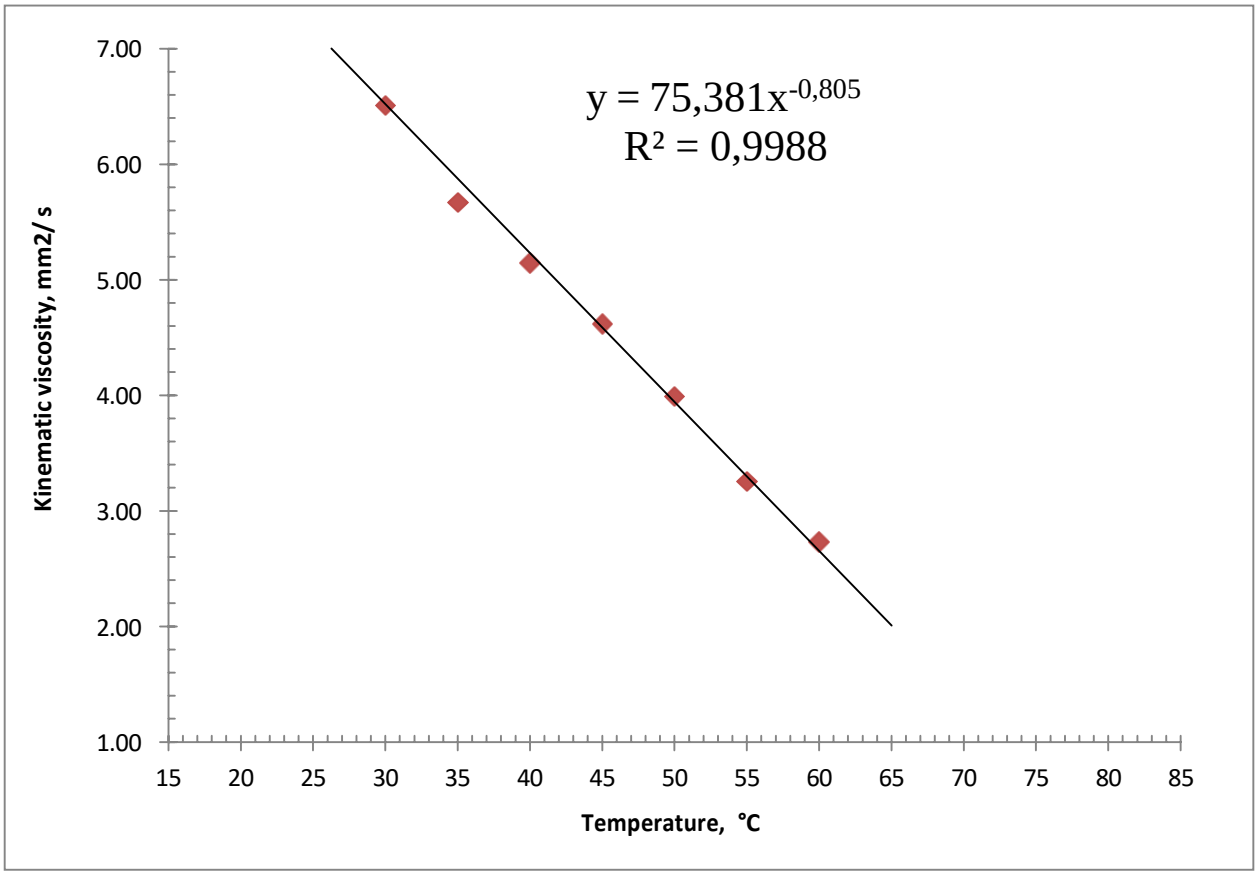

Figure 2. Graph of the dependence of density on temperature.

3.3 study of sulfur content in diesel fraction of crude oil(east iraq).

One of the most important characteristics of petroleum products during their processing is the sulfur content. This is due to the fact that deep processing of oil and oil products is carried out using various catalytic systems(Fig 3, Fig 4), for which sulfur-containing compounds are poisons and lead to rapid deactivation. Sulfur content is also tightly controlled in motor fuels. Most of Iraq crude oils are sulphurous oils. Therefore, the sulfur content in the study of the potential of Iraqi oil(east iraq) for the production of motor fuels is an important characteristic(Fig 5). In this section, we studied the change in the sulfur content in fractions boiling away at different temperatures. The sulfur content was determined by X-ray energy dispersal method.

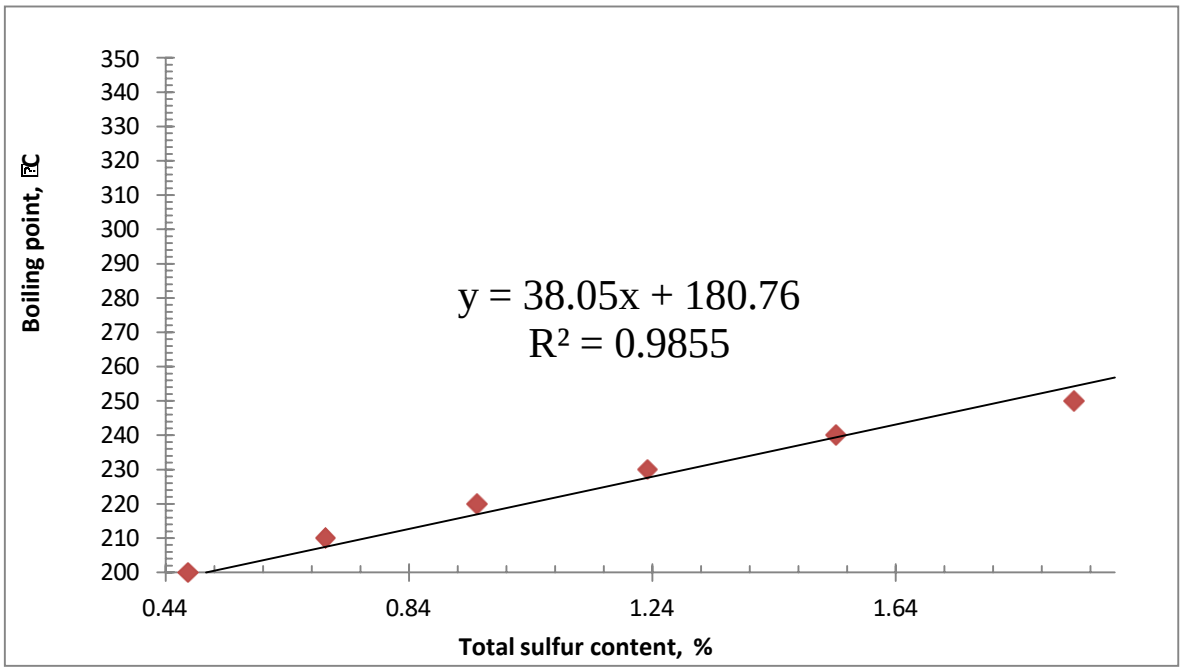

Figure 3. Boiling point of diesel fractions on the total sulfur content .

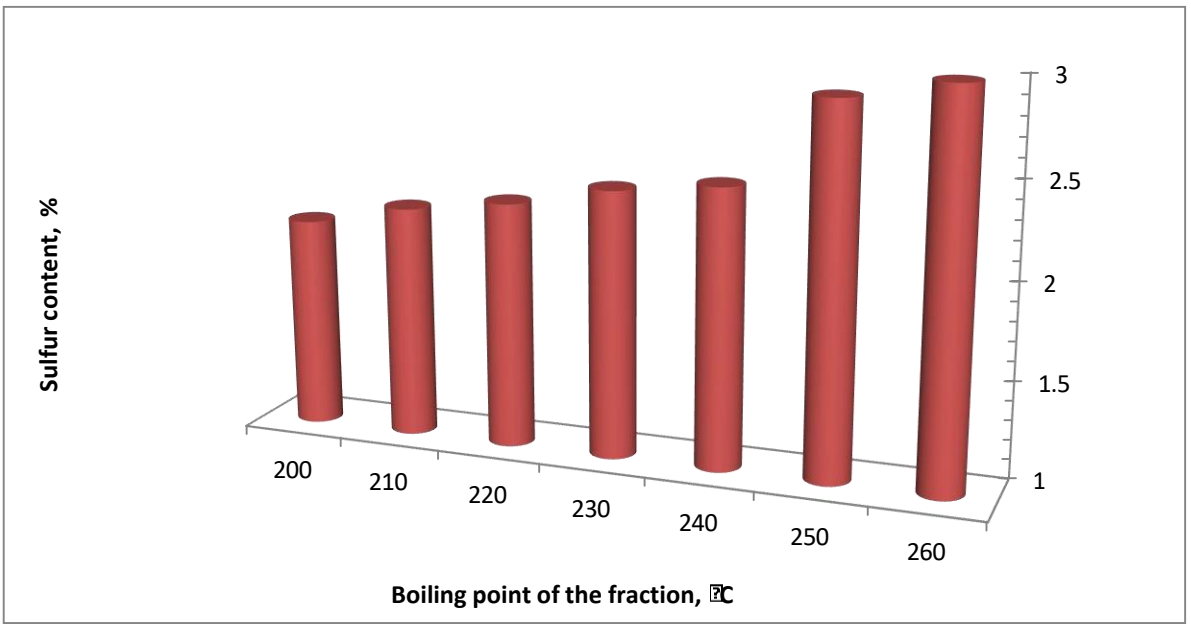

Figure 4.Total sulfur content in diesel fractions boiling at different temperatures.

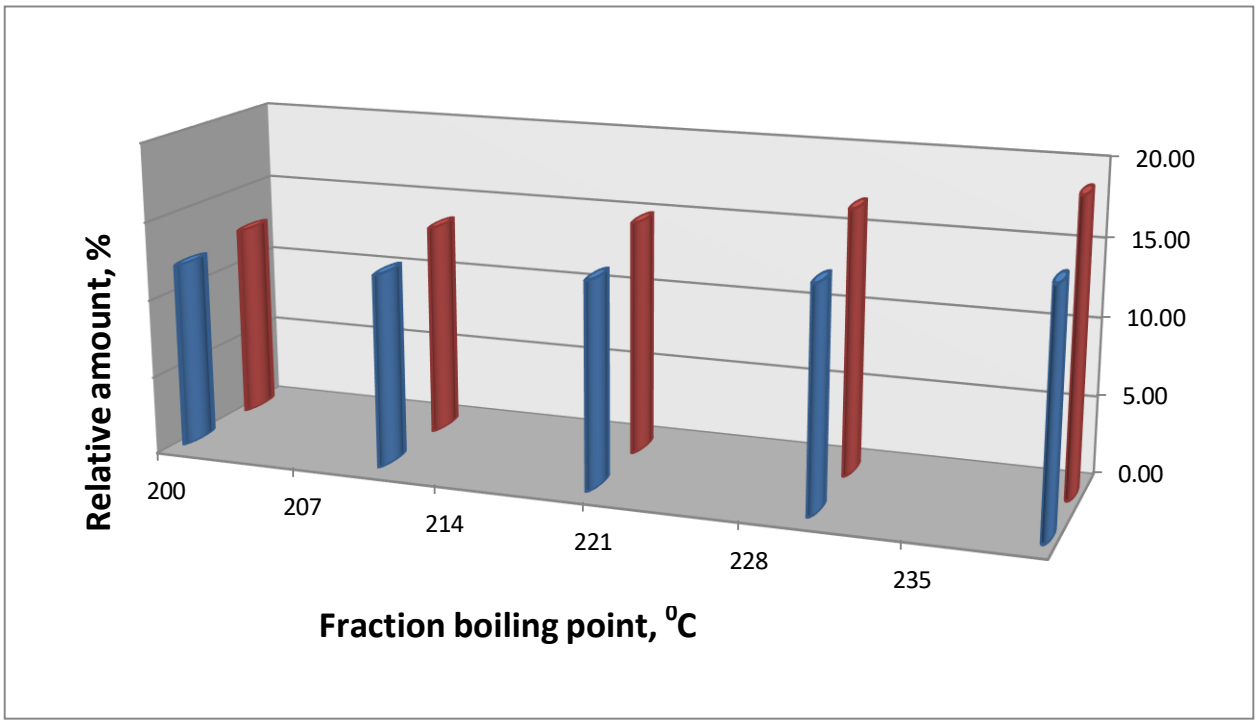

Figure 5. relative amount of fractions and the relative amount of total sulfur in these fractions at different boiling points.

The method for determining the individual and group hydrocarbon composition lies in the chromatographic separation of vapors of the diesel fraction of Iraqi (east iraq) crude oil on a capillary column with a liquid stationary phase, followed by the registration of hydrocarbons with adetector mass -selective. in the determine the component composition, the method of internal normalization was used; the calculation was performed using the peak areas of the analyzed substances, as shown in (Table 3).

Table3.hydrocarbon (HC) composition of the diesel fraction Iraqi crude oil (east iraq).

Hydrocarbon content,% mass				
n-Paraffins	isoParaffins	Naphthenes	Arena	Olefins
47.7	**33.5**	**1.8**	**14.7**	**2.3**

4. Acknowledgements

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