

CONCLUSIONS

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The vacuum residues represent the large portion of crude petroleum distillates, although they are of relatively little commercial value. Therefore it is necessary to know more details about the structural characterization of these fractions before any improved process routes for upgrading them.

Two vacuum residues were delivered from two different petroleum refineries, one from Suez Petroleum Company, the second from Alexandria Petroleum Company. The two vacuum residues were analyzed in order to know how much they contain different constituents of aromatics, resins, asphaltenes and saturates. The data of analysis show the following:

- 1- The two vacuum residues contain higher amounts of aromatics over both saturates and resins. These data was given after solvent extraction using three different solvents having different carbon number, two are pure aliphatic, namely n-pentane and n-Hexane, while the third is ethyl acetate. Because n-heptane and ethyl acetate were more efficient in the process of solvent extraction, the n-pentane was only used in the case of Alexandria vacuum residue. Whatever the solvent used, the order of the percentage of the three components was: Aromatics > Resins > Saturates.
- 2- The vacuum residue from Suez company was found to have higher aromatic content than that present in the Alexandria vacuum residue, while Alexandria vacuum residue have higher percentage of both resins and saturates.
- 3- The data also show that the vacuum residue from Alexandria company have higher asphaltene content than that present in Suez vacuum residue.

- 4- The separated Maltenes were subjected to column chromatography in order to separate the saturates (n-paraffins plus cyclo-paraffins) and aromatics (mono-, di-, and poly-aromatics).
- 5- The separated saturates were then subjected to gas liquid chromatographic analysis to show how much n-paraffins and cycloparaffins are contained in the saturate fraction separated from the Maltenes of each vacuum residue. The data of gas chromatography show that Maltenes separated from Suez and Alexandria residue using n-heptane have the greatest value of n-paraffins. The data of gas chromatography also show that, although ethyl acetate is less efficient as a solvent for n-paraffins, it is more efficient than n-pentane which was used only as a solvent for Alexandria vacuum residue.
- 6- The infrared absorption spectroscopy was used for the analysis of our studied residues and their solvent extracts. The data of the infrared studies showed that the two vacuum residues contain high amounts of aromatics. The mono aromatics represent the lowest constituent among the aromatics present, while the poly aromatic and di-aromatics are predominantly present and form the major constituent.
- 7- Our data on the two vacuum residues showed that Suez vacuum residue contains total aromatics higher than that contained in Alexandria vacuum residue, it is about 1.5 times in Suez residue than that in Alexandria residue. In the same time the di-aromatics and poly aromatics are approximately the same in both Suez and Alexandria vacuum residues, but the mono aromatics in the Suez vacuum residue is approximately double that present in Alexandria vacuum residue. On the other hand the di aromatics and poly aromatics in the Suez vacuum residue, each of them is approximately 1.5 times than that in Alexandria vacuum residue. The infrared of the separated saturates confirm the contamination of some traces of aromatics

- 8- The data of the ultraviolet studies of the separated aromatics and their constituents of mono-, di-, and poly-aromatics show that the alumina column chromatography, even it is a usual method for separating such components, but some of the di-aromatics and polyaromatics are usually contaminate the monoaromatics fraction.
- 9- The elemental distribution of sulfur, nitrogen, vanadium and nickel show that, as a whole, the weight percent of the nonmetals sulfur and nitrogen in Alexandria vacuum residue is higher than that in Suez vacuum residue. These percentage are 3.09 wt % sulfur and 0.65 wt % nitrogen in Alexandria vacuum residue, while the corresponding values in Suez vacuum residue are 2.89 wt % sulfur and 0.44 wt % nitrogen. On the other hand, the percentages of the metallic constituents of vanadium and nickel in the Suez vacuum residue are than those present in Alexandria vacuum residue. Always the vanadium content in the two residues is higher than nickel content. The nickel contents are 113.45 ppm and 89.94 ppm in Suez and Alexandria vacuum residues respectively, while the corresponding values of vanadium content in the two residues are 145.23 ppm in Suez residue and 118.23 ppm in Alexandria residue.

Finally, from our study, and from the data obtained, we can conclude that the two vacuum residues can be easily upgraded in order to obtain useful products. The vacuum residue from Suez, as it contains higher amounts of heavy metals, it affect the catalytic upgrading because the heavy metals chelates cause poisoning and fouling the catalyst and corrode the equipments and parts of the catalytic plants.

From our study, we can also conclude that ethyl acetate is highly efficient as a solvent extractor for the vacuum residues than both n-pentane and n-heptane. This is fully agreed with data given in the literatures.

It was stated and concluded that the product yield depends on the constituents of the feedstock. They found that most of the gasoline yield originate from the saturate constituent of the vacuum residue while the aromatic constituent contributes to gasoline and diesel yield. Therefore, we can conclude that the vacuum residue of Alexandria may be suitable for the production gasoline when upgraded while the residue of Suez is more suitable for the production of much quantities of diesel fuel over gasoline. This is because the vacuum residue from Suez contains higher amounts of aromatic that contained in Alexandria vacuum residue which contains approximately double saturate fraction as more as that in Suez.

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8. REFERENCES

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ARABIC SUMMARY





جامعة بنها . كلية العلوم
قسم الكيمياء

تقييم المخلفات البترولية كأساس لإنتاج مواد أخرى

رسالة مقدمة من

السيد خيرى عطية
بكالوريوس علوم - كيمياء

للحصول على درجة الماجستير فى العلوم - كيمياء

تحت إشراف

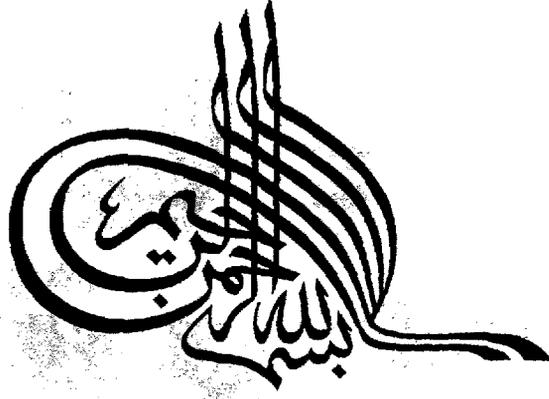
الدكتور/ محمد حسين مصطفى أحمد
أستاذ الكيمياء العضوية المساعد
قسم الكيمياء - كلية العلوم
جامعة بنها

الأستاذ الدكتور / على أحمد محمد الباسوسى
أستاذ الكيمياء
قسم التحليل والتقييم
معهد بحوث البترول

الدكتور / سمير محمد السيد

باحث
قسم التحليل والتقييم
معهد بحوث البترول

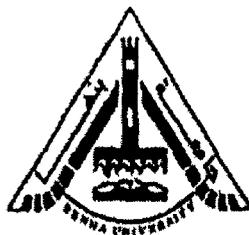
٢٠٠٧ م



(قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا
عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ)

بِسْمِ اللَّهِ
الرَّحْمَنِ الرَّحِيمِ

[سورة: البقرة - الآية: ٣٢]



جامعة بنها
كلية العلوم
قسم الكيمياء

تقييم المخلفات البترولية كأساس لإنتاج مواد أخرى

اسم الباحث: السيد خيرى عطية

المشرفون:

التوقيع	الوظيفة	الاسم
	أستاذ الكيمياء قسم التحليل والتقييم معهد بحوث البترول	أ.د/ على أحمد محمد الباسوسى
	أستاذ الكيمياء العضوية المساعد قسم الكيمياء - كلية العلوم جامعة بنها	د./ محمد حسين مصطفى أحمد
	باحث قسم التحليل والتقييم معهد بحوث البترول	د./ سمير محمد السيد



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لجنة الحكم والمناقشة

م	الاسم	التوقيع
١-	أ.د/ محمد يوسف القاضى	
٢-	أ.د/ أحمد مؤمن المصرى	
٣-	أ.د/ على أحمد محمد الباسوسى	
٤-	د./ محمد حسين مصطفى أحمد	

تاريخ المناقشة: / /

الملخص العربي

تم استعراض مجموع ما كتب فيما يتعلق بموضوع الدراسة و قد تم في هذا الصدد التطرق إلى نبذة مختصرة عن خواص الخامات البترولية ومنتجاتها وبالأخص الخواص تلك المتعلقة بالقطفات الثقيلة والمتخلفة. كما تضمن الاستعراض التطرق إلى الطرق ألتبعه في التطوير والأستفاده من القطفات الثقيلة والمتخلفة وذلك بغرض تحويلها إلى مواد بترولية أكثر افاده.

في الجزء العملي تم دراسة التركيب الكيميائي لمركبين ثقيلين تم جلبهما من شركتي بترول مختلفتين ، هما شركة الأسكندرية لتكرير البترول وشركة السويس لتصنيع البترول.

ولقد تم تعريض هاتين العينتين للدراسة المنشودة ، وذلك باستخدام الفصل بالطرق الطبيعية بطريقة المذيبات ألعضويه. ولقد تم انتقاء ثلاثة مذيبات هي : n-Pentane, n-Heptane and Ethyl acetate. والهدف من استخدام المذيبات ألعضويه هو فصل كل من "ألما لتينات Maltenes" و "أسفلتين Asphaltenes" و "الراتينجات Resins" من ألقطفه الثقيلة.

باستخدام "كروماتوجرافيا السائل Liquid Column Chromatography" تم تحليل "ألما لتينات Maltenes" وذلك بهدف فصل مكوناتها من "المواد ألمشبعه Saturates" و "المواد العطرية (Mono-, Di- and Poly-) Aromatics" .

باستخدام طريقة التحليل بالأشعة فوق البنفسجية والمرئية "Ultraviolet - Visible" تم التعرف تفصيلا على عناصر "المواد العطرية (Mono-, Di- and Poly-) Aromatics" . أما أأشعه "التحت الحمراء Infrared" فقد تم استخدامها للتعرف على المجموعات الوظيفية "Functional Groups" في كل من القطفات الثقيلة ومكوناتها من "ألما لتينات Maltenes" و "أسفلتين Asphaltenes" و "الراتينجات Resins".

باستخدام "كروماتوجرافيا الغاز Gas Liquid Chromatography" تم التعرف على مكونات المواد ألمشبعه "Saturates" من البارافينات المعتادة "n-Paraffins" البارافينات أألقطيه "Cycloparaffins"