A Study of the Purification of Lean Solvent in Aromatics Extraction Unit.

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Abstract

The feedstocks of No.7 Aromatic Extraction Unit are aromatic oil coming from No.4 Naphtha Cracking Unit and New No.3 Naphtha Cracking Unit. The extractive distillation column utilizes high boiling point solvents (Sulfolane, 3 methyl Sulfolane) that are capable of the affinity to aromatic hydrocarbons, which reduce the activity coefficient of aromatic hydrocarbons and enhance the activity coefficient of non-aromatic hydrocarbons. The raffinate from top of the column is non-aromatic hydrocarbons. The extract from bottom of the column is solvent and aromatic hydrocarbons.

The extract is separated at the solvent recovery column (V-7002) to obtain the solvent at the bottom and aromatic hydrocarbons at the top.

As the lean solvent contains too many aromatic hydrocarbons, it cannot reduce the activity coefficient of aromatic hydrocarbons and enhances the activity coefficient of non-aromatic hydrocarbons effectively. Thus, the separation efficiency of the extractive distillation column is

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reduced and the energy consumption is increased.

No.7 Aromatic Extraction Unit started up in Aug. 2013. The content of heavier non-aromatic hydrocarbons is from 10% going up to 18% gradually from Jan. 2014. The separation efficiency of the extractive distillation column dropped significantly.

The staffs of Lin-yuan plant and RMRI discussed the way to remove the heavier non-aromatic hydrocarbons contained in lean solvent. After having performed the experiment in the laboratory, the way to remove the heavier non-aromatic hydrocarbons contained in lean solvent has to be verified.

The staffs of Lin-yuan plant and RMRI planned together on the flow sheet of the removing of heavier non-aromatics contained in lean solvent. The Lin-yuan plant completed the revamping work in Jan. 2015.

The removing operation of the heavier non-aromatic hydrocarbons contained in lean solvent started from Feb. 2015 to Dec. 2015. The content of sulfolane and 3 methyl Sulfolane contained in lean solvent is from 82% to 98% during the removing operation.

The average flow rate of the total heating steam of reboiler is 61,645 Kg/h before the purifying procedure of lean solvent (from Jan. 2014 to Jan. 2015). The average flow rate of the total heating steam of reboiler is 53,537 Kg/h after the purifying procedure of lean solvent (from Feb. 2015 to Dec. 2015).

The average flow rate of the total heating steam of reboiler per KL feedstock is 825 Kg before the purifying procedure of lean solvent (from Jan. 2014 to Jan. 2015). The average flow rate of the total heating steam of reboiler per KL feedstock is 519.8 Kg after the purifying procedure of lean solvent (from Feb. 2015 to Dec. 2015).

**Keywords:** Extraction, Distillation, Sulfolane
Analysis of the Hard Sulfur Relationship between Crude Oil and Diesel

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Abstract

The objective of this work was to identify specific sulfur compounds in crude oils and diesel fuel by GC-FPD and GC-MS. Although mercaptans, sulfides, disulfides, thiophenes, benzo thiophenes, dibenzothiophenes and alkyl dibenzothiophenes are common compound classes found in crude oils, 4,6-dimethyldibenzothiophene (4,6-DMDBT) and C3-DBT, as name as hard sulfurs, which are the major sulfur containing compounds present in the ultra low sulfur diesel (ULSD). In the examination of sulfur compounds both in crude oils and atmosphere gas oils (AGO, a stream of diesel fuel), we can conclude that the more hard sulfur compounds found in the crude oils, the more of them remained in AGO. However, in order to meet the specification of ULSD regulation, the higher hard sulfur content of AGO need to be operated at higher temperature as well as higher H₂/oil ratio in the hydrogen desulfurization (HDS) process. This result indicated that the sulfur content of AGO is highly dependent on the hard sulfur content of crude oil.

Keywords: crude oil, diesel, 4,6-DMDBT, GC-FPD

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Battery Characteristic Effect of Si/Carbon Anode Material on the Coherence of Si

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Abstract

As the carbon-based anode with 300mAh/g is collocated with a cathode material which has 40 percent more on energy density, this combination only gives the energy density of a full battery cell less than 10%. This is because carbon-based anode materials including graphite-based ones have an inadequate capacity in lithium-ion batteries. Because of high intercalations/de-intercalations of lithium ion, Si as an anode material reveals excessive expansion of volume and results in structure cracking as well as an interface formation from the reaction of the Si surface with an electrolyte. These unwanted behaviors give rise to a low first-cycle coulombic efficiency. Si cannot be used alone as an anode material. At present, Si is combined with carbon materials to develop an anode material as Si/carbon. Si can compensate for the low capacity of carbon materials, and the carbon material can inhibit the expansion of volume due to intercalations/de-intercalations of lithium ion into Si. Combining these two characteristics results in a synergistic effect which will enhance the anode material performance. In this study, we develop an anode material of Si/carbon from integrating the morphology, particle sizes, and added ratios of Si as well as a dispersing agency into carbon materials as a buffer in order to study a synergistic effect between Si and carbon. Furthermore, the effective influence on the battery characteristics of Si/carbon anode materials will be discussed and analyzed systematically.

Keywords: Si/Carbon Anode Material, Synergistic Effect, Expansion of Volume

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Influences of Different Oxidants on Microbial Community Structure in Petroleum-Hydrocarbon Contaminated Soil

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Abstract

In situ chemical oxidation (ISCO) in combination with the bioremediation method is an attractive technology to effectively remedy petroleum-hydrocarbon contaminated soil. This composite technology is involved in the chemical reactions of oxidants to decompose/desorb the hydrocarbons from the soil particles, followed by a microbiological degradation process to mineralize the pollutants. The sophisticated operation of the two processes requires understanding of effects of oxidants on soil microbial community structure. However, the underlying knowledge is very limited. In this study, we analyzed microbial communities before and after three oxidants (sodium percarbonate, hydrogen peroxide and sodium persulfate) were used to remedy petroleum-hydrocarbon contaminated soil and evaluated the influence of low-dosage chemical oxidation on soil microbial community structures. The results showed that during chemical oxidation phase, the three oxidants led to different pH environments with hydrocarbon removal efficiencies lower than 20%. Higher removal efficiencies were observed during the bioremediation phase. Among the three oxidants used, sodium percarbonate mixed with ferrous ion had the highest removal efficiency, 73.3%. The analysis of the V3-V4 region of

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bacterial 16S rRNA gene showed that the microbial community structures in the bioremediation phase were greatly determined by the oxidants used with or without the ferrous ion. Despite the oxidants, many hydrocarbon-degrading microbial populations, such as Methylobacterium, Sphingomonas, Rhodococcus, Propionibacterium, Pseudoxanthomonas, Micrococcus, Burkholderia and Novosphingobium could be still detected in medium to high abundance. Principal component analysis suggested that the members of the genus Geothrix can survive at the usage of the three oxidants, and played an important role in degrading the hydrocarbons at a broad range of pH conditions. The overall results obtained in this study demonstrated the potential of the composite technology for the remediation of hydrocarbons from the soil.

**Keywords:** Petroleum Hydrocarbon, In Situ Chemical Oxidation (ISCO), Bioremediation, High-Throughput Sequencing, Bacterial Community Structure
Efficacy Trials of No.1 EGCG Green Tea (II)

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Abstract

The commercial drink product of green tea from Bio-CPC is used to test its ability of reducing cholesterol accumulation in the mouse's blood. The Syrian Hamster mice are divided randomly into 4 groups: normal diet group (ND), high energy diet group (HE), low-dose group (HE-L, 120.9 mL / kg / day, equivalent to 1 times of the recommended human dose) and high-dose group (HE-H, 604.3 mL/kg, equivalent to 5 times of the recommended human dose). Each group has at least 6 mice. After a 6-week treatment, the mouse that administers with green tea shows the reduced concentrations of total cholesterol, tri-acyl glycerol and LDL-C in their blood than the control mouse. The mice on fat diet (HE) are found to have ~3 times more cholesterol and tri-acyl glycerol concentrations than that on normal diet (ND). Moreover, the low density cholesterol (LDL) concentrations of mice, in both HE-L and HE-H groups, are significantly less than the HE group. These results demonstrate that this commercial green tea drink can effectively lower the blood tri-acyl glycerol, cholesterol, and LDL concentrations in Syrian Hamster mice.

Keywords: Green Tea, Cholesterol, Tri-Acyl Glycerol, Low Density Cholesterol

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