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A COMPARATIVE STUDY ON OPTIMIZATION OF THE NANO MAGNETIC MATERIAL IN RECYCLE FUEL OIL

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Abstract:

Quality of recycle fuel oil could be affected by the degradation of storage stability and colour. In this review paper briefly cover the comparison of uses of magnetic particles, Fe_3O_4, SiO_2, and Al_2O_3 which is used to determine the fuel stability such as sulphur content, effect of colour degradation and pH analysis by using FTIR, Uv-Vis Spectroscopy and GC-MS. Gas chromatography-mass spectrometry (GC-MS) were used to identify the chemical constituents in the prepared recycle fuel oils (waste lubricants oil). ASTM D1500 were used in order to determine the visuality of a colour from waste lubricants oil and the UV-Vis spectroscopy with 1 cm of optical glass is used for measurement [16]. CaO nano catalyst supported by Fe_3O_4 magnetic particles were prepared by dissolving the calcium nitrate in deionized water with appropriate amount and 3.5g of Fe_3O_4 is added into the solution prepared. Then the suspension will be observed until a pH of 12 were appeared. Then, the samples colour was compared with the standard glass colour according to ASTM D1500. Fifteen papers are used as the main references to identify the optimization of nano magnetic material in recycle fuel oil. In conclusion, all the nanomaterial investigated in this present review paper shown the positive result where the quality of recycle fuel oil produced meets the standard. In this present review paper shows that among all the nano material investigated in this present review paper, Fe_3O_4, SiO_2 and Al_2O_3 has great potential to be used as a low-catalyst in recycle fuel oil (RFO)

*Keywords***:**
Recycle Fuel Oil, Nano-Magnetic Material, Desulphurization, Fe_3O_4, SiO_2, Al_2O_3

Objectives:

- To review the optimization of nano magnetic material in recycle fuel oil.

- To address the methods used to synthesis the nano magnetic material.

Methodology:

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│          Online Database search and books                │
│        •  Science Direct                                 │
│        •  Research Gate                                   │
│        •   Elsevier                                       │
│        •  Taylor & Francis                               │
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│               Journal articles and books                 │
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│                 Relating RFO and MNPs                    │
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                RFO: Recycle Fuel Oil
              MNPs: Nano-Magnetic Particle
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│                Classification of papers                  │
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│                  Graphically analyzed                    │
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│                Discussion and Conclusion                 │
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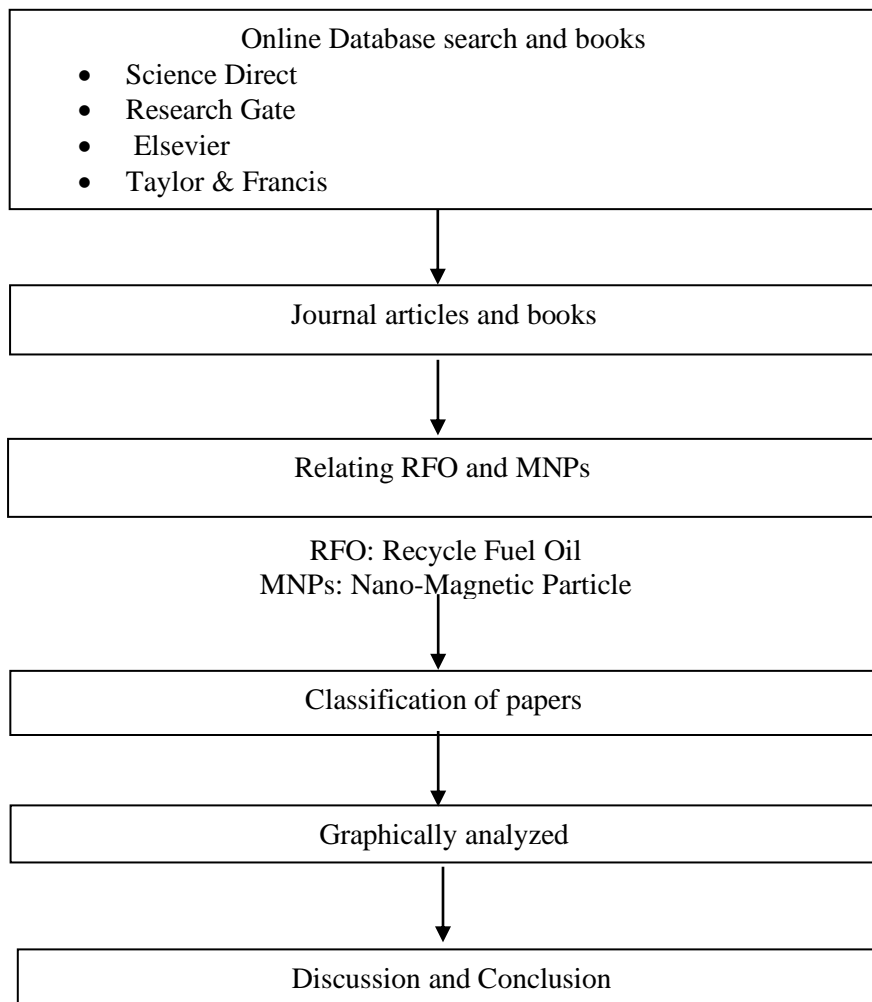
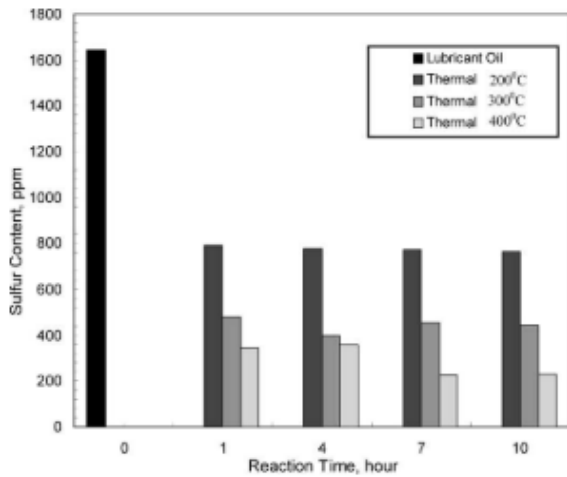Figure 1 Flow Diagram of Research Methodology

Results:

Figure 2 Thermal treatment of waste lubricant oil at various temperature

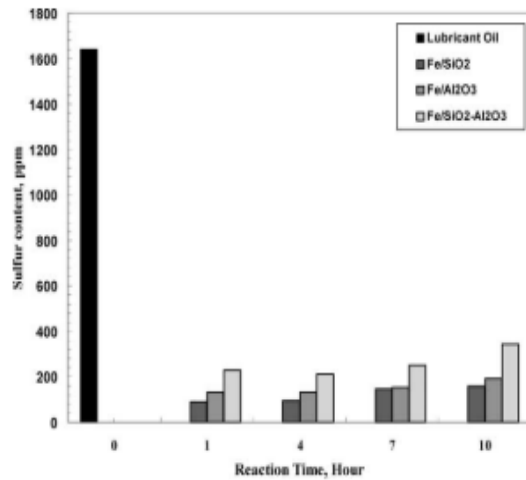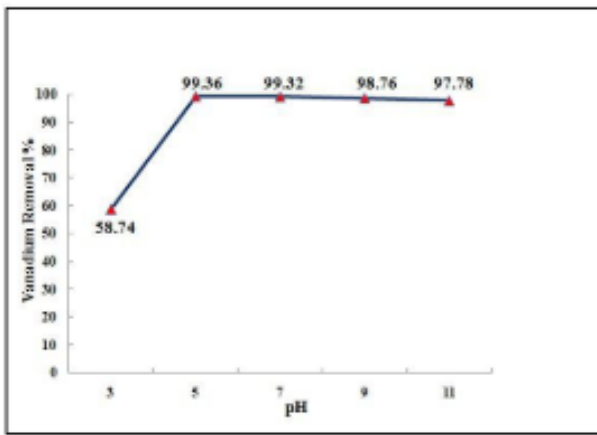Figure 3 Catalytic treatment of waste lubricant oil with Fe/SiO_2, Fe/Al_2O_3 and $Fe/SiO_2-Al_2O_3$

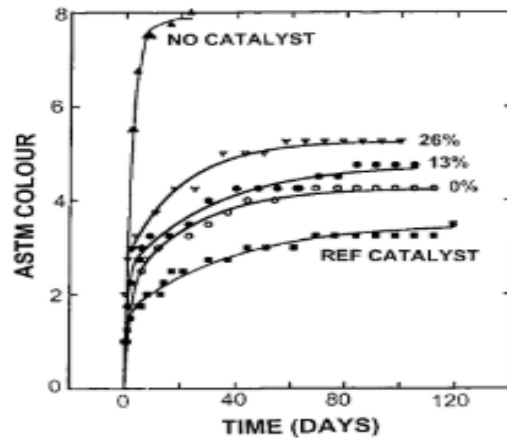Figure 3 The effect of pH on Vanadium removal efficiency by the HA/Fe_3O_4 nanoparticles

Figure 4 ASTM Colour vs Storage time (4days)

Conclusion:

The treatment of wastes has become one of the most important concern of modern society to protect the environment. The use of lubricating oils or recycle fuel oil in various application is increasing due to it importance's. The presence of heteroatoms such as Sulphur, nitrogen, chlorine and bromine in fuel oil poses serious problems for secondary use as fuel or any other

application. Therefore, the development of suitable methods and catalyst/sorbents for the removal of heteroatoms and to stabilize the storage of the fuel oil is a necessary step. This review paper therefore focuses on the comparison of process condition and chemical characterization of recycle fuel oil (RFO) and optimization of Nano-magnetic material as catalyst/additives leading to the creation of economically viable as well as sustainable feedstock for the production of recycle fuel oil and briefly reviews the optimum process condition of recycle fuel oil (RFO) production. This comparative study presents the findings for effectiveness of the nano magnetic material in enhancing the fuel stability of the RFO. It is observed that by adding nano-magnetic material in recycle fuel oil, desulphurization activity decreases by 95%. MNPs also enhanced the colour degradation of the RFO from dark to lightest color and difference of preparation of catalyst is also one of the factors. Lastly, by adding an MNPs into recycle fuel oil, this study found that the pH value also affecting the fuel stability of the RFO. As mentioned in the results, with additives the pH value increases the removal of vanadium from fuel oil at 0.5mg KOH/g.