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Forensic Discrimination of Fake and Genuine Mobil Oils

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Abstract

The major functions of lubricating oils is the reduction of friction and wear by the separation of surfaces, metallic or plastic, which are moving with respect to each other. The few Indian infringers are engaged in cheating, substandard and duplication cases forensic scientist and police facing problems with rapid increase in different types of Mobil oils having hydrocarbons and other additives. Which can be used for comparison purpose keeping in this view a protocol for rapid screening and analysis of these type of material by using physical parameters, thin layer chromatography and FT-IR spectral analysis have developed to differentiate fake (used) Mobil oil and genuine unused branded Mobil oils.

The present work describes the discrimination of fake and genuine Mobil oils on the basis of physical parameters, thin layer chromatography and FT-IR analysis.

Keywords: Mobil oils; TLC; FT-IR analysis.

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Introduction

The major functions of lubricating oils is the reduction of friction and wear by the separation of surfaces, metallic or plastic, which are moving with respect to each other. Petroleum base Mobil oils mainly consist of Paraffinic, Naphthenes and aromatics. The lubrication property of the particular lubricant depends on the distribution of these hydrocarbons. It consists of C_{28} to C_{40} hydrocarbons. Identification of the lubricating agent is difficult undertaking because of the broad range of products and the possibility of contamination and degradation, which may occur during use in the vehicle [1-3].

There has been regular emergence of new brands of Mobil oils due to lifting the restriction on the marketing by private companies. The prices obviously vary depending on the purpose of use; grading etc. the adulteration problem has also come to the surface like other commonly used petroleum products viz. petrol and diesel oils. Not all engine oils sold in the market are genuine. With today's technology, synthetic engine oil syndicates are able to imitate the well-known brands. Examples of well-known brands in the market are Castrol, Shell, Motul and Pennzoil. Subsequently, there are three categories of lubricants in the market namely mineral, semi synthetic and fully synthetic. For synthetic oils, it is formed through some complex additional chemical processes to ensure the formation and production of a good liquid lubricant. Engine oil function is allows smooth steel movement in the engine. The usage of fake engine oils will result in the engine oils unable to absorb the heat generated. This cause the engine quickly

heating up and the shift will become rugged and wear and eventually cause overheating of the engine. Therefore, the type and grade of engine oils should be suitable to maintain engine resistance. Subsequently, car user also needs to follow the scheduled change of engine oil to prevent component wear as the engine oil viscosity level would already reduce significantly.

One of the ways to recognize or detect the fake engine oil is by comparing the smell with the original engine oil. Alternatively, you are recommended to buy directly from a legitimate distributor. This is because the risk of buying fake engine oil is higher when buying from any third party. Besides that avoid from buying any engine oil at a lower prices than the market prices. Using the right or appropriate oils to our vehicles will not only protect and extend the engine life, but also increase the engine performances while helping to save on the car maintenance and the fuel costs. Large circulation of fake (used) Mobil oil in some major cities of M.P. assumed alarming situation for both police and public. The few state infringers were engaged in cheating, substandard and duplication cases forensic scientist and police facing problems with rapid increase in different types of Mobil oils having hydrocarbons and other additives. Which can be used for comparison purpose keeping in this view a protocol for rapid screening and analysis of these type of material by using physical parameters, thin layer chromatography and FT-IR spectral analysis have developed to differentiate fake (used) Mobil oil and genuine unused branded Mobil oil.

Materials and Methods

The fake Mobil oil samples physical parameters compared with genuine Mobil oil sample furnished by authenticated source (castrol).

Table: Physical parameters

S. No.	Physical parameter	Fake Mobil oil	Genuine Mobil oil
1	Fluorescence	Blue	Violet
2	Viscosity in secs /70°C	45 sec	98 sec
3	Specific gravity	0.8843	0.890
4	Flash point	210	240
5	Refractive index	1.488	1.476

Thin Layer Chromatography

A standard TLC plated was coated with slurry of silica gel G in water to a uniform thickness of 0.25 mm the plate was activated by heating in an oven at 100°C for about 1 hour an aliquots of genuine Mobil oil and fake Mobil oil were spotted on to the plate, which was developed with chloroform: benzene (50:50) in a presaturated TLC chamber to a height of 10 cm. The plate was removed from the chamber dried in air in which sprayed with 50% sulphuric acid. The brownish coloured spots appeared after one hour heating in oven at 160° in white background. The Rf values are as follows:

1. Fake Mobil oil 0.15, 0.45, 0.65 and 0.85.
2. Genuine Mobil oil 0.35, 0.49, 0.75 and 0.90.

FT IR Spectroscopy

FTIR Spectra studies were performed on the Perkin Elmer one spectrophotometer using universal ATR accessories, Spectrum recorded between 600-4000 cm-1 and the obtained spectrum compared which showed clear deviation in both the samples proved to be of different origin.

Peaks for fake (used) oil- 727.29, 1051.7, 1161.7, 1380.87, 1464.5, 2854.04

Peaks for genuine oil- 511.60, 720.45, 1046.57, 1161.51, 1380.87, 1459.12, 2848.66, and 2932.29.

Results and Discussions

Fake (used) mobil oils has emerged as one of the serious form of economic and cheating offences during past few years in India and caused a serious set back to economy of the nation and general public.

Mobil oils are costly commodity used in spark plug engines. The high cost of this oil tempts illegal syndicates to adulterate this with lower cost or used burnt processed oils sell under brand names. The easy availability of burnt oil and easy processing and higher profit attract these infringers to sell these products to fetch higher profit, which causes serious problems in spark plug engines. The effect of deterioration of engine can be seen in short period. Also this type of cheating causes serious environmental pollution.

The lower Specific Gravity value of fake oil indicates Presence of high boiling solvents or admixture of lower gravity oils. The Viscosity is the property of its resistance to flow. Viscosity is the most important single property of lubricating oil.

Conclusion

In this study the value of the viscosity of fake oil is lower than the genuine oil it clearly indicates

fuel dilution or admixture with low viscosity oils. Similarly different values of Rf in TLC and different peaks in both the oils clearly prove oils of different origin. The present method protocol is able to differentiate fake and genuine oils for criminalistic inference.

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