CHAPTER I

INTRODUCTION

Introduction

A frequently serious problem about petroleum fuel trading systems was the taxation evading. The large amounts of petroleum products had been smuggled. These smuggled petroleum fuels had the similar physical and chemical properties as the taxed petroleum fuels. So they were needed to clearly ' distinguish for commercial and safety reasons. The same petroleum fuels used for different purposes should have differing priced or taxes. For example, gasoline for highway vehicles was commonly taxed at higher rates than non-vehicular purposes such as mining, lumbering or fishing. Furthermore, the adulteration of higher priced products with lower priced products and the addition of low-taxed light lubricating oil to highly taxed diesel fuel were the purposes for evading taxation,too. For these reasons, the government should have the strict measures to solve these problems.

In the past, a great variety of azo dyes had been used for many years to color the distillates or petroleum fuels in the form of powders, flakes, or granules. They had a limited solubility and a low rate of dissolution. On the other hands, the liquid azo dyes should have been prepared and which had excellent tinctorial power, excellent stability against crystallization at low temperatures, high solubility in petroleum fuels to which they were added. [1]

For the fore-mentioned reasons, the liquid azo dyes should be used for coloring and marking (or tagging) the petroleum fuels to distinguish them

following their purposes. But dyes alone were not adequate securely and reliably mark or tag the petroleum fuels because many dyes were easily removed by unauthorized persons. Thus a combinaton of a dye and a marker was used to mark the petroleum fuels. [2]

Marker dyes had another advantages for example identification of particular batches of petroleum fuels for protection against thief , detection of owned petroleum fuels by government, military or commercial consumers. Finally, marketers of the substitution of brand name products should tag their products with marker dyes to detect the substitution of other's products in their distribution system.[3]

Metal organic compounds, radioactive substances and specific compounds had been proposed to use for marking or tagging petroleum fuels. They had many disadvantages for example metal organic compounds had very poor storage stability. The uses of radioactive substances required special equipment and precautionary measures to prevent harmful disturbances to personal. In case of specific compounds, quinizarin was an excellent marker which was extracted from petroleum fuels by aqueous caustic solutions. But it had the disadvantages of low solvent solubility. Furfural could develop an intense red-colored complex with aniline acetate but it was produced in the middle petroleum distillates. [4]

So the novel marker dyes should be liquid azo dyes. They could be silent in petroleum fuels and identified by the detection procedures and the

quantitative determinations with the most appropriate method. Moreover, they should have high storage stability in petroleum fuels.

A raw material in this research was the cashew nut shell liquid having many reasonable choices for its uses. First, it was the natural product which was composed of the mixtures of phenolic -OH compounds. That could be coupled with chloronitroaniline derivatives to obtain the azo dyes as markers. Furthermore, it had an availability, very low costs and very high quantities. The cashew nut shells had been the by-products from the cashew nut production industry . An advantage of the raw material from the natural products was the reduction of cost productions and the import of foreign chemicals.

In case of the petroleum fuel using in this research, diesel oil was reasonably chosen. Large amounts of diesel oil could be frequently smuggled for evading taxation purposes. Because it had very wide varieties of uses for example many heavy-duty vehicles and engines.

1.1 The scopes of research

The synthesized marker dyes were present in diesel oil with parts-per-million quantities and they must be silent in it. The marker dyes could be extracted by the appropriate petroleum-immiscible solutions. They could be shown their specific visual color by a small amount of extractant. It means these solutions should remove substantially all of the marker dyes from the sample of diesel oil being tested. This method was called "the detection procedures". The appropriate solvent extraction systems , the concentration of marker

dyes in diesel oil and the ratio of oil phase to aqueous phase (extractant) were studied. The synthesized marker dyes were provided relatively to the quantitative determinations. They were important in cases where dilution and adulteration were suspected. Finally, the storage stability of these marker dyes were measured their levels in the period of every weeks for three months.

1.2 The objectives of research

1. To synthesize a family of homologous marker dyes from the cashew nut shell extract and 4 types of chloronitroanilines.
2. To develop the detection procedures in the field tests and the laboratory methods.
3. To study the stability of the synthesized marker dyes which were added in diesel oil.