CHAPTER V
CONCLUSION

In summary, the azo dyes from diazonium salts of aniline, *o*-toluidine, *m*-toluidine or *p*-toluidine and methyl salicylate, 2-ethyl-1-hexyl salicylate or esterified cashew nut shell extract were prepared and characterized by FT-IR and NMR spectroscopy. The azo dyes, which were prepared from diazonium salts of aniline, *o*-toluidine, *m*-toluidine or *p*-toluidine with methyl salicylate, did not dissolve well in commercial high-speed diesel oil. Therefore, the other azo dye compounds, which were freely soluble in diesel oil, were applied for the novel marker dyes. In addition, these azo dye compounds gave yellow color in organic solvent, so they can use as dye in fuel oil such as gasoline. The 3 and 5 parts-per-million azo dyes, which were prepared by 2-ethyl-1-hexyl salicylate and esterified cashew nut shell extract, respectively, were added into commercial diesel oil in order to inspect quality of diesel fuel oil. As a result, they had no effect on physical properties of diesel fuel oil.

The detection procedure was carried out by solvent extraction technique. The suitable ratio of diesel oil to extracted solution, which extracted marker dyes from diesel oil, was 9:1. The suitable concentration of marker dyes, which was obviously detected both in the field test and laboratory inspection, were in the range of 1 to 5 parts-per-million. The suitable extraction solution systems consist of cosolvents; methanol, ethylene glycol and base; potassium hydroxide or morpholine. All of marker dyes gave yellow color in the extracted phase. As the result, they appeared that alkyl substituent on aromatic amine could not alter the color appearance of marker dye. The quantitative analysis of marker dyes could be precisely detected by UV-VIS spectroscopic technique. Importantly, all of marker dyes in diesel fuel oil were stable for at least three months. In addition, these novel marker dyes would possibly be used to tag the other commercial fuel oil.

SUGGESTION

In this research, marker dyes were synthesized by coupling reaction of diazonium salts with aromatic amine possessing electron releasing substituent groups. The electron withdrawing groups in these positions should be studied in order to increase the varieties of marker dye. In addition, some extraction systems were not suitable for some commercial fuel oils, so the extraction systems should be developed. In this research, marker dyes were prepared in laboratory scale, so industrial scale preparation should be studied. Moreover, the other techniques can be used for detection of marker dyes in fuel oil.