

CHAPTER V

CONCLUSION AND SUGGESTION

Cashew nut shell liquid (CNSL), the waste from processing cashew nut, was used as a starting material for synthesis of cardanol sulfonate. The cardanol sulfonate was synthesized from CNSL using following steps. The first step was decarboxylation of natural CNSL by heating at 135-140 °C for 3 hours. Then, the decarboxylated CNSL was reacted with formaldehyde and diethylenetriamine to purify the cardanol with 80 % yield. The last step was sulfonation of purified cardanol with fuming sulfuric acid (oleum), and sodium hydroxide was used to neutralize sulfonic acid to give sodium cardanol sulfonate with 86.47 % yield by mole of product.

The physical properties of cardanol sulfonate was compared with dodecylbenzene sulfonate. The minimum surface tension of dodecylbenzene sulfonate and cardanol sulfonate were found to be 28 mN/m at 15 % w/v and 32.25 mN/m at 20 % w/v, respectively. The C.M.C. values of dodecylbenzene sulfonate and cardanol sulfonate were 0.435 and 0.372 mol/l, respectively. Using dodecylbenzene sulfonate as a reference, percentage detergency of cardanol sulfonate was found to be 93.7 %. This results meet the requirement of ICS standard which is specified that washing powder should have over 80 % detergency, in comparison with reference.

Cardanol is essentially a composition of CNSL extracted from the shells of cashew nut, a good natural alternative to petrochemically derived alkylbenzene and a low cost renewable resource. Surfactant properties of cardanol sulfonate are found to be similar to these of dodecylbenzene sulfonate, therefore, cardanol sulfonate may be used as raw material for commercial detergent production.

Cardanol sulfonate may probably be produced in industrial scale because of sulfonation of cardanol gave high yield of 86.47 % by mole and production process of cardanol sulfonate is not complicated because there are no a difficult step of alkylation of benzene before sulfonation like common alkylbenzene sulfonate. Production of cardanol sulfonate in industrial scale does not need high cost, in comparison with production of common detergents.

Suggestion for further studies

- For the future work, industrial scale production of cardanol sulfonate should be carried out using SO_3 gas in place of SO_3 from H_2SO_4 .
- Other bases such as metal oxide, ammonium or amines should be investigated for neutralization step of sulfonation of cardanol.
- Application of anionic cardanol sulfonate surfactant could be studied.



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