Faculty of Science

Chemistry Department

Comparative Studies on the Characteristic Produced Powder, Liquid Laundry Detergents and Liquid Dishwashing Detergents Friendly to Environment

Thesis submitted for Ph.D Degree of science chemistry

By

Ahmed Mohamed Gad Elmawla Abdelalim

M.Sc. of Chemistry, Faculty of Science, Suez Canal University, 2001

To

Department of Chemistry

Faculty of Science

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Thesis Advisors	Thesis Approval
Prof. Dr. Hoda Abdelhay Abdelhamide.	
Chemistry dept., Faculty of science, Ain Shams University	----------
Prof. Dr. Youssef Aly El-Shattory.	
Fat and Oil dept., National research Centre of Egypt	----------

Head of Chemistry Department

Prof. Dr.Ibrahium H.A.Badr

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APPROVAL SHEET

Title of the thesis:

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Evaluation comminute.

Name	Position	Signature
Prof. Dr. Hoda Abdelhay Abdelhamide	Chemistry dept., Faculty of science, Ain Shams University	
Prof. Dr. Youssef Aly El-Shattory	Fat and Oil dept., National research Centre of Egypt	
Prof. Dr. Ahmed Helmi Mahmoud Ibrahium Elwahy	Chemistry dept., Faculty of science, Cairo University	
Prof. Dr.Emtesal Elesawy	Chemistry dept., College of Women, Ain Shams University	

الدراسات العليا :

ختم الإجازة : **اجيزت الرسالة بتاريخ :**

موافقة مجلس الكلية **موافقة مجلس الجامعة**

Faculty of Science

Chemistry Department

Qualifications

Name: Ahmed Mohamed Gad Elmawla Abdelalim

Science Degree: PhD.

Department: Chemistry

College: Faculty of Science

B.Sc.: 1995

M.Sc.: 2001

Job: Quality and R&D manager of ARMA group

Abstract

Comparative Studies on the Characteristic Produced Powder, Liquid Laundry Detergents and Liquid Dishwashing Detergents Friendly to Environment

Submitted for the degree of Ph.D. of Science in Chemistry

By Ahmed Mohamed Gad Elmawla Abdelalim

Significantly expanding of current Egyptian market of detergent which forced the producers to develop their products to adequately meet a wide new varieties of end-user requests. Developing of powder and liquid laundry detergent depend mainly on understanding the behaviors of main components of powder like surfactant, builder, bleaching agents and enzymes. Evaluated the primary washing performance of surfactants individually or binary with builders under optimum conditions using standard artificially soiled fabrics which represent the common stains in Egyptian customer live. Evaluate incrustation efficiency of some builders and its alternatives in powder and liquid laundry detergent. Study the stability of enzymes in liquid and powder laundry detergent compared to market products. Results indicate fatty alcohol C_{12}-C_{18}, 7 moles ethylene oxide has the highest average total stains remover index among all types of selected surfactants, and followed by sodium alkyllbenzene sulfonate C_{11}-C_{13} then soap made from 80% palm oil and 20% palm kernel oil. Fatty alcohol C_{10}-C_{18}, 5 moles ethylene oxide has the lowest total stains remover index. Sodium tripolyphoshate improve washing performance of alkyllbenzene sulfonate $\mathbf{C_{11}}$-$\mathbf{C_{13}}$ and fatty alcohol C_{12}-C_{18}, 7 moles ethylene oxide and soap 80% palm oil/20%palm kernel. Sodium carbonate and sodium silicate kept comparable washing performance with fewer amounts of alkyllbenzene sulfonate $\mathbf{C_{11}}$-$\mathbf{C_{13}}$ and fatty alcohol C_{12}-C_{18}, 7 moles ethylene oxide. In case of soap 80% palm oil/20%palm kernel they cannot compensate the reduction of its percentage. Our prototype formulation with less amount of alkyllbenzene sulfonate $\mathbf{C_{11}}$-$\mathbf{C_{13}}$ and nonionic 7 EO or soap gave higher SRI value and lower foaming level than multinational products in Egyptian market.

Abstract

Our experiment had showing that 20% sodium tripolyphoshate, 3% homo polycarboxylate (acrylic acid, molecular weight 5000) or 3% copolymers polycarboxylate (acrylic acid or maleic acid, molecular weight 70000) or 3% 1-hydroxyethane (1, 1-diylbisphosphonic acid or 3% acetodiphosphonic acid or 3% diethylenetriamine pentamethylene phosphonic acid to our base formulations reduce ash content to the same level of market products 0.65% , 0.95% ,0.75%, 0.53% , 0.76% , 0.95% respectively. Liquid laundry detergent has some disadvantage compared with powder laundry detergent as lower washing performance than powder laundry detergent formulations because of limitation to use some chemicals in liquid formulation plus instability of enzymes with storage conditions. That why liquid laundry detergent cannot replace powder laundry detergent totally in our local market. Enzyme show instability in liquid laundry detergent formulation at 40 ^{0}C for one month.

Developed of manual dishwashing liquid products depend mainly of selection an optimum mixture of surfactants. formulation of manual dishwashing liquid detergent with ionic, nonionic and zwitterionic surfactants mixtures were investigated in respect to viscosity, cloud point, foaming power, foam features, washing performance, irritation test, in addition to its cost, in comparison with that produced by multinational companies in their own factories in Egypt. It has been found that the formulations containing Linear alkyl benzene sulphonic acid are characterized by higher performance of removing stain, without any stain deposition on dishes, in addition to moderate foaming power which is diminished with hard water. Our proposed formulations 10% sodium alkylbenzene sulfonate with 2% sodium laurylether sulphate and 2% cocamidopropylbetain oxide or 2% cocamidopropylamine oxide have resulted in better washing performances, less irritations, higher viscosity, comparable cloud points and lower cost than multinational market products H and P which contain 12% Sodium linear alkylbenzene sulfonate with 6% sodium laurylether sulphate and 9% sodium laurylether sulphate and 6% cocamidopropylamine oxide respectively.

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AHMED GAD

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