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PALM-BASED GLYCERINE SOAP

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INTRODUCTION

'Cleanliness is next to godliness' is a well known quotation. Cleanliness can be achieved through washing and this is where soap plays an important role. Soap has been in existence since the year 2000 BC and its role as a cleansing agent has been well established, so much so that the soap processing has developed tremendously over the years.

Rapid development in soap technology has resulted in a variety of soap products. One of the soap products is transparent/translucent soap which is also known as glycerine soap because of its high content of glycerine. One of the well established soap is the 'Pear Transparent Soap' which was manufactured in 1789, and can still be found in the market today.

Glycerine soap technology is based on tallow, coconut and castor oils as the raw materials. In the case of opaque toilet soap, palm products can be used as alternative raw materials to tallow and coconut oil. For transparent/translucent soap, the tallow and coconut portions of the formulation can also be replaced by palm products.

BASIC RAW MATERIALS

The basic raw materials for making translucent soap are as follows:

- Coconut oil, Palm Kernel oil } source of C12-C14 fatty acids
- Tallow, Palm oil/Products } source of C16-C18 fatty acids
- Castor oil
- Glycerine
- Alcohol Polyols } to enhance transparency/ translucency

PROCESS

There are four processes for the manufacturing of transparent/translucent glycerine soaps.

- alcohol process
- cold process
- semi-boiled process
- direct neutralization of fatty acids

PROPERTIES

The soaps should have the following properties:

- A "see-through" property with normal vision
- Free caustic should not be more than 0.05%

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- Moisture content of 12%–20%
- Titre value of 37°C–40°C
- Sodium chloride content of 0.2%–0.7%
- Sugar and other additives of approximately 6%
- Iodine value of 40–50.

PALM-BASED FORMULATION

The soaps made from palm-based products were based on the formulation in *Table 1*.

TABLE 1. PALM-BASED GLYCERINE SOAP FORMULATION

Raw Materials	Amount (%)
Palm-based fatty acid	17.6
Palm kernel oil	22.4
Castor oil	2.0
NaOH (34%) (< 40°C)	21.5
Alcohol	15.0
Glycerine (65°C)	10.0
Sugar solution (50%)	8.5
EDTA in sugar solution	0.03
Sodium lauryl ether sulphate	3

The fatty acids used in this experiment were C16, C18 and triple-pressed stearic acid (TPS). The soap was made in a closed system. The palm-based samples obtained had the properties shown in *Table 2*. Analyses of palm-based soaps were made immediately after production. The commercial soaps were obtained from the supermarkets and most probably had been on the shelf for some time. Therefore any comparison has to take into account the lapse in time.

The moisture content of our samples was between 25%-27%. Total fatty matter ranged from 43%-48% while the iodine value was 10-11. Since the analysis was carried out soon after production, most of the moisture was probably still retained in the sample and this could account for the slightly high moisture content of the soap. The amount was comparable to the commercial sample (Brand A). The low total fatty matter may be due to high content of moisture in the samples and with evaporation of the moisture it should increase slightly. However the soap made from C18 and TPS fatty acids had a moisture content comparable to Brand A.

The iodine value of our samples was low because the raw materials used were saturated acids and palm

TABLE 2. CHEMICAL AND PHYSICAL PROPERTIES OF COMMERCIAL AND EXPERIMENTAL SOAPS

Parameters \ Samples	Shisheido	Kappus	C16	C18	TPS
Moisture Content %	20.1	9.5	27.0	25.4	25.2
Free Caustic/ Free Acid	0.07	0.96	0.13	0.22	0.21
Total Fatty Matter	47.8	72.7	43.3	48.9	48.2
Iodine value	34.38	47.70	10.15	11.18	10.23
FAC % WT					
C 8:0	2.2	0.8	1.0	1.2	1.1
C10:0	2.0	0.8	1.2	1.4	1.3
C12:0	15.6	7.3	22.0	23.3	22.3
C14:0	7.8	3.9	9.0	8.7	9.0
C16:0	19.2	40.1	52.3	8.6	31.6
C16:1	0.9	0.1	-	-	-
C17:1	3.2	-	-	-	-
C18:0	11.6	4.1	3.7	45.0	23.8
C18:1	31.8	33.1	9.4	10.4	9.7
C18:2	2.9	9.2	1.2	1.3	1.1
C18:3	0.2	0.5	-	-	-
C20:0	0.3	0.1	-	-	-
Others	2.3	0.04	-	-	-

Figure 1. Palm-based soap initial stage .

kernel oil (IV). Our FAC content of the raw materials confirmed this (*Table 2*). One of the requirements for translucent/ transparent soap is the content of unsaturation. With this limited amount of unsaturation the samples obtained were translucent but not transparent enough. This is illustrated in *Figures 1* and *2* which show the soap immediately after production and after one year's storage respectively.

Soaps made from C18 and TPS fatty acids were found to have translucent property (*Figure1*) and the translucency remained unchanged even after one year's storage (*Figure 2*). Soap made from C16 fatty acids did not exhibit a translucent property.

X-RAY DIFFRACTION

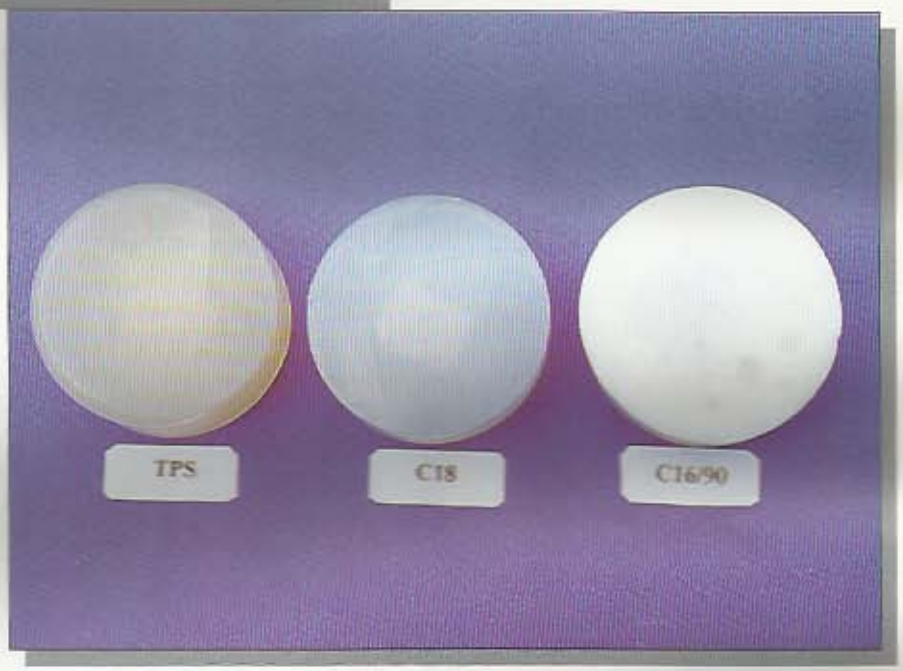

Figure 2. Palm-based soap after one year storage.

TABLE 3. X-RAY DIFFRACTION PATTERN OF COMMERCIAL SOAPS

Shisheido	Kappus	Pears Soap	TPS	C16	C18
		Long Spacing °A			
	20.50 (W) 14.23 - 13.51 (M)	14.1 (S)			
13.98-12.91 (VW)			13.76-12.51 (VW)	13.28-12.20 (VW)	
	10.50 (VW) 8.26 (VW)	10.7 (VW) 8.5 (M)			
		Short Spacing °A			
4.73-4.56 (VW)		4.65 (M)	4.73-4.57 (VW)	4.64 (W) 4.09-3.96 (VW)	4.75-4.56 (VW)
	4.62-4.46 (VW)	4.3 (?)	4.00-3.87 (VW)		3.92-3.81 (VW)
4.03-3.91 (VW)		3.95 (S)		2.92-2.87 (VW)	2.92-2.87 (VW)
	3.98-3.86 (W) 2.71 (VW)	3.25 (VW) 2.85 (M)			

Table 3 shows the x-ray diffraction patterns of both the commercial and palm-based samples. The x-ray analysis was carried out using a powder camera. The results showed that the commercial sample, Brand A, and palm-based sample made from TPS acid have very similar patterns. C16 and C18 fatty acids soap short spacing diffraction patterns were also closer to that of Brand A. Generally, the samples showed broad bands rather than sharp lines. This indicated the crystal in both commercial and palm-based samples may be extremely fine β^{1} form resembling an amorphous nature.

CONCLUSION

- Even though the palm-based materials were less unsaturated compared to the two commercial samples, soap from TPS and C18 fatty acids showed good transparency.
- Both TPS and C18 fatty acids soaps showed similar X-ray patterns to the commercial sample.
- After one year's storage, the soap samples were found to be visually transparent/translucent.

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