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(54) **Detergent liquid.**

(57) The viscosity of aqueous structured liquid detergent compositions containing a fabric softening clay material is limited by incorporation of a non-peptising/non-building electrolyte such as sodium formate, chloride or sulphate.

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DETERGENT LIQUID

The invention relates to a liquid detergent composition, in particular to a liquid detergent composition for washing fabrics and imparting a softness thereto.

Our European Patent Application published under No. EP-A-225 142 describes an aqueous built fabric softening heavy duty liquid detergent which contains a low-swelling clay as a fabric softening material. A number of specific builder salts and clays are suggested for use. The low-swelling clays are chosen to avoid significant increase in product viscosity by virtue of their incorporation, especially in compositions which exist as structured liquids. This is important because too low a viscosity can result in long term product instability when the product contains undissolved material in suspension, whereas too high a viscosity makes product processing and use by the consumer difficult.

We have now found that the degree of swelling of the clay is not only governed by the clay type itself but also by the presence of builder salt or other electrolyte, which tends to inhibit swelling, although in some circumstances may actually promote it. We have discovered that there is a variation in the 'efficiency' of electrolytes to inhibit swelling, i.e. they differ in the minimum concentration in aqueous solution at which they demonstrate such inhibition. In this context, we have found it convenient to classify electrolytes into two broad categories, namely:-

- peptising electrolytes, which tend to promote swelling of the clay, except at the highest concentrations; builder salts are generally peptising electrolytes
- non-peptising electrolytes, which tend to inhibit clay swelling, even at relatively low concentrations.

This phenomenon will be described in more detail hereinbelow.

It is the use in aqueous structured detergent liquids of one class of non-peptising electrolytes, namely non-peptising/non-building electrolytes (hereafter terms NPNB's) which is novel and surprisingly confers the advantage of efficient inhibition of clay swelling. Thus, a reduction in viscosity is achievable, even with medium, and to some extent high swelling clays without an unacceptable rise in viscosity.

The present invention now provides a liquid detergent composition comprising

- (i) an aqueous base;
 - (ii) detergent active material; and
 - (iii) electrolyte; in proportion sufficient to create a structuring system with solid-suspending properties; the composition further comprising a fabric softening clay material and the electrolyte comprising a non-peptising/non-building electrolyte (as hereinbefore defined) in an amount sufficient to limit the viscosity increase due to incorporation of the clay;
- said composition at 25°C having a viscosity of no greater than 2.5 Pas at a shear rate of 21s⁻¹ and yielding no more than 2% by volume phase separation upon storage at 25°C for 21 days from the time of preparation.

Aqueous liquid detergents in which the aqueous base, detergent active(s) and electrolyte result in a structuring system with solid suspending properties are very well known in the art, although these known compositions do not contain the Clay/NPNB combination. Thus, those skilled in the art are readily able to select from a very wide range of surfactant and electrolyte types and amounts to achieve such a system. These systems are known both with and without solids actually being suspended in them.

One particular form of such a structuring system comprises a dispersion of lamellar droplets in an aqueous phase which contains dissolved electrolyte. These lamellar dispersions are just one of a number of structuring systems with solid suspending properties which are already known from a variety of references, e.g. H.A.Barnes, 'Detergents', Ch.2. in K.Walters (Ed), 'Rheometry: Industrial Applications', J.Wiley & Sons, Letchworth 1980.

Lamellar droplets consist of an onion-like configuration of concentric bilayers of surfactant molecules, between which is trapped water or electrolyte solution (aqueous phase). Systems in which such droplets are close-packed provide a very desirable combination of physical stability and solid-suspending properties with useful flow properties. Their presence in a liquid detergent product may be detected by means known to those skilled in the art for example, optical techniques, various rheometrical measurements, x-ray or neutron diffraction, and electron microscopy.

In practice, such lamellar dispersions not only used for their solid suspending properties but are also used to endow properties such as consumer preferred flow behaviour and/or turbid appearance. Examples of such structured liquids without suspended solids are given in US patent 4 244 840 whilst examples

where solid particles are suspended and disclosed in specifications EP-A-160 342; EP-A-38 101; EP-A-104 452 and also in the aforementioned US 4 244 840. Others are disclosed in European Patent Specification EP-A-151 884, where the lamellar droplets are called 'spherulites'.

Although the present invention embraces many aqueous surfactant electrolyte systems with solid suspending properties (either without, or preferably with solids additional to the clay suspended therein), the embodiments comprising lamellar dispersions are especially preferred.

The present invention requires the claimed compositions at 25°C to have a viscosity of no greater than 2.5 Pas at a shear rate of 21s⁻¹. However, most preferred are those which have a viscosity of no greater than 1.75 Pas at the latter temperature and shear rate.

The fabric softening clays in general, may be classed as low, medium or high swelling. For the purposes of the present invention, the following definitions apply. The low swelling types (substantially as used in compositions described in our aforementioned unpublished specification) are those having a swellability (determined as herein described) in an 8% sodium tripolyphosphate solution of less than 25%.

The medium swelling types are those having a swellability in an 8% sodium tripolyphosphate solution of from 25% to 75%.

The high swelling clays are those having a swellability in an 8% sodium tripolyphosphate solution of greater than 75%.

The swelling behaviour of the clays is quantified by the following test.

A dispersion is prepared at room temperature containing 435g of water, 40g sodium tripolyphosphate and 25g of clay material (the sodium tripolyphosphate is completely dissolved in the water before the addition of the clay).

The dispersion is stirred for 5 minutes with a magnetic stirrer and then placed in a 1000 ml measuring cylinder. The dispersion is then left to stand, undisturbed for two weeks. After this time the dispersion is examined. Generally some separation will have occurred. A lower layer of dispersion or gel containing the clay will be visibly distinguishable from a relatively clear upper layer. The height of the lower layer (h) and the overall height of the total liquid (H) are determined and percentage swellability (S) is calculated using the expression

$$S = \frac{h}{H} \times 100$$

The following Table classifies a number of typical fabric softening clays according to this rule:-

TABLE

	<u>TRADE NAME</u>	<u>CLAY TYPE</u>	<u>SWELLING</u>	
			<u>S (%)</u>	<u>CLASS</u>
	LAPORTE CP103)		95	HIGH
	CLARSOL KC1)	Ca Bentonite	86	HIGH
	MDO 77/84)		73	MEDIUM
	STEETLEY NO 1)	white	14	LOW
	STEETLEY NO 2)	bentonite	20	LOW

The level of fabric softening clay material in the product is preferably at least 1% by weight, but not more than 10% by weight. A most preferred level is from 3% to 7% by weight.

The NPNB's are those electrolytes which have the property of preventing peptisation (and hence swelling) of the clay by any peptising electrolyte and/or detergent active which may be present in the formulation. This is useful because it is the swelling which causes a viscosity increase and that is what the present invention seeks to reduce. Here it must be mentioned that we believe that knowledge of the link between swelling and viscosity was not in the public domain prior to publication of our aforementioned co-pending application. The peptising phenomenon is one which can be determined by experiment.

One suitable methodology for this determination is using a medium-to high-swelling natural sodium bentonite. This is preferred over calcium bentonite, which could result in deviating initial effects being observed on first addition of the electrolyte under test. This effect may be due to ion-exchange and

consequent transformation of the calcium clay to the sodium (or other relevant cation) form. For each test composition, the chosen amount of electrolyte is first added with stirring to water, followed by the clay. The amount of clay is determined by prior experiment (as hereinbefore described) as that resulting in a swellability (S) of the sodium bentonite in water is about 75%. After addition of the clay to the test composition, the swellability (S) is again tested as a function of electrolyte concentration.

A peptising electrolyte will exhibit an increase in swellability up to moderate electrolyte concentrations, whereas a non-peptising electrolyte will show a decrease in swellability, even at relatively low concentrations.

Thus, by way of Example, Figure 1 shows a plot of the swellability of a high-swelling natural sodium bentonite (Clarsol W100) in water, as a function of clay concentration. From this, a clay concentration of 1.5% by weight is chosen as corresponding to a swellability of about 75%. The swellability of this amount of clay is plotted as a function of the concentration of a dissolved electrolyte under consideration. A typical result is shown in Figure 2, the clay and its concentration being those derived from Figure 1. It can be seen that with sodium tripolyphosphate (STP) and sodium citrate, there is first an increase, then a decrease in swellability of the clay, with increasing electrolyte concentrations and so by the present definition, these are peptising electrolytes. On the other hand, with sodium chloride and sodium formate, an immediate and marked decrease in swellability is seen as electrolyte concentration is increased from zero. Thus, the latter two are non-peptising electrolytes.

Thus, as stated, even if demonstrating at least some non-peptising properties, the NPNB's are not those electrolytes which are known as calcium ion sequestrant and/or precipitant builders, such as the various alkali metal carbonates, bicarbonates, phosphates, silicates, borates etc. These are already known as ingredients in clay containing liquid detergents. What is surprising in the present invention is that other electrolytes can be used and they mitigate the swelling induced viscosity increase when incorporated in amounts which are low relative to the proportions in which builder salts are commonly used. It should also be noted that the definition of NPNB's also excludes those salts which are usually employed for purposes other than building but which are known to have subsidiary builder properties, or are converted to builders in the wash solution. One example of such a material is sodium perborate bleach.

By inhibiting the swelling of the clay, the NPNB's limit the resultant viscosity increase of the composition. For the avoidance of doubt, viscosity increase means the viscosity rise substantially immediate upon introduction of the clay in the manufacturing process and it also refers to a clay swelling induced rise in viscosity on standing or during storage. It does not encompass any viscosity increase due to progressive ordering in any active structuring phase which also may be present.

The NPNB's do not in general totally negate the viscosity rise due to the clay but they are certainly capable of reducing it to an acceptable level. As a rule, they are incorporated in amounts such as to limit the clay swelling (by the test hereinbefore described) to no more than 45%, preferably 35%, especially 25%. To achieve this, it is normally necessary for them to be present from about 0.5 to about 10% by weight of the total composition, typically from about 1 to 5%, even from about 1.5 to 2%. In one generally preferred class of embodiments, the amount of NPNB is less than 5% by weight.

The use of NPNB's in clay containing compositions is especially useful when the structuring system is used to suspend solid builder particles. In such compositions, most, if not all of the NPNB will be in solution in the aqueous phase, which may contain other dissolved electrolyte material such as builder salts. It is well known that care must be taken in formulating and manufacturing active structured systems in order to avoid increase of viscosity to an unacceptable level. This problem is exacerbated when clay is present and the NPNB's help to mitigate this effect.

The NPNB's may be selected from a very wide range of organic and inorganic salts of metals, preferably alkali metals, for example formates, acetates, halides (such as chloride) and sulphate. The potassium, and especially sodium salts are preferred.

The detergent compositions of the present invention necessarily contain one or more detergent active materials.

The detergent compounds may be selected from anionic, nonionic, zwitterionic and amphoteric synthetic detergent active materials. Many suitable detergent compounds are commercially available and are fully described in the literature, for example in "Surface Active Agents and Detergents", Volumes I and II, by Schwartz, Perry and Berch.

The preferred detergent compounds which can be used are synthetic anionic and nonionic compounds. The former are usually water-soluble alkali metal salts of organic sulphates and sulphonates having alkyl radicals containing from about 8 to about 22 carbon atoms, the term alkyl being used to include the alkyl portion of higher acyl radicals. Examples of suitable synthetic anionic detergent compounds are sodium and potassium alkyl sulphates, especially those obtained by sulphating higher (C_8-C_{18}) alcohols produced for

example from tallow or coconut oil, sodium and potassium alkyl (C_8-C_{20}) benzene sulphonates, particularly sodium linear secondary alkyl ($C_{10}-C_{15}$) benzene sulphonates; sodium alkyl glyceryl ether sulphates, especially those ethers of the higher alcohols derived from tallow or coconut oil and synthetic alcohols derived from petroleum; sodium coconut oil fatty monoglyceride sulphates and sulphonates; sodium and potassium salts of sulphuric acid esters of higher (C_8-C_{18}) fatty alcohol-alkylene oxide, particularly ethylene oxide, reaction products; the reaction products of fatty acids such as coconut fatty acids esterified with isethionic acid and neutralised with sodium hydroxide; sodium and potassium salts of fatty acid amides of methyl taurine; alkane monosulphonates such as those derived by reacting alpha-olefins (C_3-C_{20}) with sodium bisulphite and those derived from reacting paraffins with SO_2 and Cl_2 and then hydrolysing with a base to produce a random sulphonate; and olefin sulphonates, which term is used to describe the material made by reacting olefins, particularly $C_{10}-C_{20}$ alpha-olefins, with SO_3 and then neutralising and hydrolysing the reaction product. The preferred anionic detergent compounds are sodium ($C_{10}-C_{15}$) alkyl benzene sulphonates and sodium ($C_{10}-C_{18}$) alkyl sulphates.

Suitable nonionic detergent compounds which may be used include in particular the reaction products of compounds having a hydrophobic group and a reactive hydrogen atom, for example aliphatic alcohols, acids, amides or alkyl phenols with alkylene oxides, especially ethylene oxide either alone or with propylene oxide. Specific nonionic detergent compounds are alkyl (C_6-C_{22}) phenols-ethylene oxide condensates, generally 5 to 25 EO, ie 5 to 25 units of ethylene oxide per molecule, the condensation products of aliphatic (C_8-C_{18}) primary or secondary linear or branched alcohols with ethylene oxide, generally 5 to 40 EO, and products made by condensation of ethylene oxide with the reaction products of propylene oxide and ethylenediamine. Other so-called nonionic detergent compounds include long chain tertiary amine oxides, long chain tertiary phosphine oxides and dialkyl sulfoxides.

Amounts of amphoteric or zwitterionic detergent compounds can also be used in the compositions of the invention but this is not normally desired due to their relatively high cost. If any amphoteric or zwitterionic detergent compounds are used it is generally in small amounts in compositions based on the much more commonly used synthetic anionic and/or nonionic detergent compounds.

Mixtures of detergent active materials may be used. In particular, we prefer a mixture of an anionic detergent active and a nonionic detergent active. Especially when the product is in the form of a structured liquid, soap may also be present.

Where the detergent active material is soap, this is preferably selected from alkali metal salts of fatty acids having 12 to 18 carbon atoms. Typical such fatty acids are oleic acid, ricinoleic acid, and fatty acids derived from castor oil, rapeseed oil, groundnut oil, coconut oil, palmkernel oil or mixtures thereof. The sodium or potassium salts of these acids can be used.

The level of detergent active material in the product is preferably at least 2% by weight, but not more than 45% by weight, most preferably from 6% to 15% by weight.

Although the present invention centres on the use of NPNB's, this does not preclude the incorporation of a detergency builder material to reduce the level of free calcium ions in the wash liquor and thereby improve detergency. This material may be selected from precipitating detergency builder materials such as alkali metal carbonates and ortho-phosphates, ion-exchange builder materials such as alkali metal aluminosilicates and sequestering builder materials such as alkali metal tripolyphosphates, citrates and nitrilotriacetates. Particularly preferred is sodium tripolyphosphate for reasons of product structure and building efficiency. At least 5% by weight of the detergency builder material is required to provide a noticeable effect upon detergency.

In general, it is preferred that the level of detergency builder material in the product is more than would dissolve at 20°C. In the case of sodium tripolyphosphate, a preferred level is from 22 to 35% most preferably from 15 to 35%, based on the weight of the product.

The liquid detergent composition of the invention may further contain any of the adjuncts normally used in fabric washing detergent compositions, eg sequestering agents such as ethylenediamine tetraacetate; buffering agents such as alkali silicates; soil suspending and anti-redeposition agents such as sodium carboxymethyl cellulose and polyvinylpyrrolidone; fluorescent agents; perfumes; germicides; and colourants.

Further, the addition of lather depressors such as silicones, and enzymes, particularly proteolytic and amylolytic enzymes; and peroxygen bleaches, such as sodium perborate and potassium dichlorocyanurate, including bleach activators, such as N,N,N',N'-tetraacetyl ethylene diamine, may be useful to formulate a complete heavy duty detergent composition suitable for use in washing machines.

Also particularly beneficial are agents for improving the thermal stability of the product, such as sodium toluene sulphonate, xylene sulphonate or cumene sulphonate, at levels of up to 1% by weight, such as from 0.4% to 0.5%.

In addition to the active-structuring system, it is also possible to include so-called 'external' structuring agents, e.g. of the polymeric type.

The products of the present invention may be prepared by a variety of methods. However, we have found that benefits arise from mixing ingredients in a particular order. Thus, it is preferable to add at least a portion of the NPNB and optionally also, any detergency builder which may be present, to water, before adding the clay and the detergent active material. In this way products having uniform rheological properties from batch to batch can be obtained. In particular, an example outline of one preferred method comprises adding the necessary quantity of water to a mixing vessel provided with a stirrer. An amount of from one part in four up to the full amount of the total electrolyte (NPNB plus detergency builder) is then added, with stirring. This amount must include at least part, preferably all, of the NPNB. Where the NPNB is water-soluble, this amount will dissolve in the water and prevent the clay material from swelling out will not be sufficient to impair the stability of the composition. The clay material is then added and dispersed with stirring. Anionic and nonionic detergents, including soap where this is present, are then added. The remaining part of the electrolyte is then added with stirring until a homogeneous mass is obtained.

Finally, the mixture is cooled (if necessary) under constant agitation and water is added, if necessary, to compensate evaporation loss. Thereafter perfume may be added when the product is at substantially ambient temperature.

Thus, we may also claim a novel and inventive process for preparing compositions according to the present invention, comprising the steps of:-

- (i) admixture with an aqueous base, of at least some of the non-peptising/non-building electrolyte, and optionally, any builder salt which is non-peptising;
- (ii) then admixing therewith, the fabric softening clay material;
- (iii) admixing with the product of step (ii), the remainder (if any) of the non-peptising/non-building electrolyte and optionally, some or all of the remainder (if any) of any builder salt which is non-peptising;
- (iv) admixing with the product of step (iii), the detergent active material; and
- (v) admixing with the product of step (iv), any peptising builder salt and the remainder (if any) of any builder salt which is non-peptising.

However, we prefer that substantially all of the non-peptising/non-building electrolyte is incorporated in step (i).

Generally, the aqueous base incorporated in step (i) will be substantially only water. Furthermore, in some instances, it is advantageous to hold back part of the water (whether or not the aqueous base in step (i) contains other components) so contacting the clay with an even higher electrolyte concentration, this remaining water then being added after incorporation of the clay.

In some cases, when the NPNB is added to a stable formulation, a product may result which separates on standing. Addition of the clay to such an unstable formulation may result in restabilisation.

For the avoidance of doubt, where any step in the process of the present invention entails admixture of more than three components, these may be contacted sequentially or with any two or more simultaneously, in any desired order.

The invention will now be illustrated by the following examples.

Example 1

Formulations A-E were prepared with the ingredients listed in Table I. In each case the components were added to the water in the order reading from the top of the table to the bottom.

The compositions were prepared in four series, where the 'clay' was

- a) - absent, i.e. replaced by an equivalent quantity of water
- b) - Laporte CP103, a high swelling clay
- c) - MDO 77:84, a medium swelling clay
- d) - Steetley, a low swelling clay.

In addition to compositions A-E, a reference formulation, containing no sodium formate (but an equivalent quantity of water) was also prepared for each of the four clay series (a)-(d).

The viscosity of each composition was measured after 2 weeks, 4 weeks and 3 months. The results are presented in Tables IA, IB and IC respectively. The tables also show the aqueous concentration of the initial dose of sodium formate upon addition.

After three months, four of the compositions with the low swelling clay and two with the medium

swelling, showed signs of instability. The % phase separation is shown beside the viscosity figures in Table IC. In this and all other examples, viscosity and stability were determined at 25°C unless explicitly stated to the contrary:-

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Table I : all amounts % w/w

	A	B	C	D	E
10 Water	51.6	51.6	51.6	51.6	25.3
	<u>order of addition</u>				
NaFo	0	0.5	1	2	2
15 Clay	5	5	5	5	5
Water	0	0	0	0	25.8
ABS-acid			7.0		
20 Synp. 7			3.0		
NaOH			0.9		
Glycerol			5.0		
Borax			3.5		
25 STP			22		
NaFo	2	1.5	1	0	0

30 These results demonstrate that inclusion of clay in the presence of a builder electrolyte (STP) but in the absence of an NPNB electrolyte (sodium formate) results in a high viscosity product. When an NPNB is also incorporated, the viscosity is reduced and this effect is most marked when this electrolyte is added before the clay.

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TABLE IA

At beginning		(Viscosity (mPas) at 21s ⁻¹ after 2 wks)						
	<u>% NaFo</u>	<u>% water</u>	<u>NaFo Conc.</u> <u>g/100 g water</u>	<u>No clay</u>		<u>Laporte</u>	<u>MDO</u>	<u>Steelley</u>
				(a)	(b)	CP103	77/84 (c)	(d)
-	-*	-	-	720	2490->1910	1660	1430->1200	
A	0	51.6	0	700	2380	1430	1450	
B	0.5	51.6	1.0	730	1980	1540	1450	
C	1	51.6	1.9	730	1830	1230	1220	
D	2	51.6	3.9	740	1620	1280	960	
E	2	25.8	7.8	800	1420	1170	1300	

* No sodium formate in formulation

TABLE IB

At beginning		NaFo Conc. <u>g/100 g water</u>	(Viscosity (mPas) at 21s ⁻¹ after 4 wks)			
<u>% NaFo</u>	<u>% water</u>		<u>No clay</u>	<u>Laporte</u>	<u>MDO</u>	<u>Steetley</u>
			(a)	CP103 (b)	77/84 (c)	(d)
-	-*	-	720	1820-1900	1660	1200-1240
A	0	51.6	680	2010	1660	960
B	0.5	51.6	670	1800	1440	1090
C	1	51.6	710	1600	1080	780
D	2	51.6	680	1390	1090	700
E	2	25.8	630	1230	930	650

* No sodium formate in formulation

TABLE IC

At beginning		NaFo conc. g/100 g water	(Viscosity (mPas) at 21s ⁻¹ after 3 mths)			
% NaFo	% water		No clay		MDO	Steelley
			(a)	CP103 (b)	77/84 (c)	(d)
-	-	-	840	2030	1520	1080
A	51.6	0	560	1630	1580	960
B	51.6	1.0	560	2150	1480	1090(10)
C	51.6	1.9	560	1740	1060	760(8)
D	51.6	3.9	570	1540	890(2)	570(8)
E	25.8	7.8	630	1230	800(2)	660(5)

* No sodium formate in formulation

Example 2

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Experiments were performed to test the effect of sodium sulphate and sodium chloride as NPNB's, as well as the optimum order for their addition in the total formulation. The quantities and order of addition of components is shown in Table II. The order is as descending in the table. Two control formulations are listed in the first column; the first preceding the slash(/) is without clay or electrolyte (NPNB) and the second after it, is only minus the electrolyte. The final row expresses where the electrolyte is added relative to the actives and clay. The final entry "2.1" before clay means that all electrolyte is added before the clay but the water is added in two aliquots one before and one after the clay, thus doubling the initial electrolyte concentration in solution, relative to the 1:1 before clay entry.

The viscosity of each composition, measured in mPas at 21s⁻¹ after 1 day storage is shown for compositions where the NPNB is sodium sulphate and sodium chloride, in Tables IIA and IIB respectively. In both cases, the medium and low swelling clays were those used in Example 1 but the high swelling clay was Clarsol KC1.

The results in Table IIA suggest that to achieve the effect of the present invention, namely low viscosity, with sodium sulphate, it is preferable to use medium or low swelling clays. In the case of the former, at least half of the NPNB should be added before the actives and preferably, also before the clay. With the high swelling clay, viscosity reduction was only observed where the NPNB was added before the clay, although not in too high a concentration.

Table IIB shows very comparable results with sodium chloride, except that with the high swelling clay, a small viscosity reduction was also observed when all the NPNB was added immediately after the clay.

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No Elec
or clay / No Elec12

TABLE IIANa₂SO₄ addition in process

Clay type	without Na ₂ SO ₄	end	after actives	after clay	k_2 before clay	1/1 before clay	"2/1" before clay
Without clay	660	990*	(+)	(+)	(+)	(+)	(+)
Clarsol KCl	1660	2160	2070	1740	1820	1570	1740
MDO 77/84	1660	2070	2650	1310	1550	1290	1240
Steetley	1240	1010	1190	750*	560*	610*	480*

* showing (some) instability after two weeks

(+) not measured - presumed to be as 'end' figure

TABLE IIB

NaCl addition in process

Clay type	without NaCl	end	after actives	after clay	$\frac{1}{2}$ before clay	$\frac{1}{1}$ before clay	"2/1" before clay
Without clay	660	740	(+)	(+)	(+)	(+)	(+)
Clarson KCl	1660	1820	2320	1570	1910	1490	1660
MDO 77/84	1660	2150	2730	1610	1570	1260	1510
Steetley	1240	1210	1090	860	580	610	1040-1280

(+) not measured - presumed to be as 'end' figure

Comparative Example 3

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The viscosities (mPas at 21s^{-1}) after one day, of the compositions in Example 2 are presented in Table III. For comparison, the two week figures from Example 1 are also quoted.

The results suggest that the viscosity reducing ability of sodium sulphate is approximately the same as that for sodium chloride, these being somewhat better than with sodium formate. The overall trend also shows that it is generally better for the NPNB to be added before the clay.

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TABLE III

Non-peptising Electrolyte	Without non-peptiser	end	after clay	1/1 before clay	1/1 before "2/1" before clay	Clay Type
Na ₄ Fo (2.0%)	2490*	(2380)*	-	(1830)*	(1620)*	Laporte* CP103
NaCl (1.5%)	1660**	1820**	1570**	1910**	1490**	1660**
Na ₂ SO ₄ (1.5%)	1660**	2160**	1740**	1820**	1570**	Clarson** KCl
NaFo	?	(1430)	-	(1230)	(1280)	(1170)
NaCl	1660	2150	1610	1570	1260	1510
Na ₂ SO ₄	1660	2070	1310	1550	1290	1240
NaFo	1430	(1450)	-	(1220)	(960)	(1300)
NaCl	1240	1210	860	580	610	1040-1280
Na ₂ SO ₄	1240	1010	750(+)	560(+)	610(+)	480(+)

(+) = (some) instability

Claims

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1. A liquid detergent composition comprising

- (i) an aqueous base;
- (ii) detergent active material; and
- (iii) electrolyte;

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in proportions sufficient to create a structuring system with solid-suspending properties;

the composition further comprising a fabric softening clay material and the electrolyte comprising a non-peptising/non-building electrolyte (as hereinbefore defined) in an amount sufficient to limit the viscosity increase due to incorporation of the clay;

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said composition at 25°C having a viscosity of no greater than 2.5 Pas at a shear rate of 21s^{-1} and yielding no more than 2% by volume phase separation upon storage at 25°C for 21 days from the time of preparation.

2. A composition according to claim 1, having a viscosity at 25°C of no greater than 1.75 Pas at a shear rate of 21s^{-1} .

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3. A composition according to either preceding claim, wherein the structuring system comprises a lamellar dispersion.

4. A composition according to any preceding claim, wherein the electrolyte limits swelling of the clay up to a maximum of 45%.

5. A composition according to claim 4, wherein the maximum clay swelling limit is 35%.

6. A composition according to claim 5, wherein the maximum clay swelling limit is 25%.

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7. A composition according to any preceding claim, wherein the electrolyte comprises one or more organic or inorganic salts of alkali metals.

8. A composition according to claim 7, wherein the salt or salts are selected from formates, acetates, halides and sulphates.

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9. A method of washing a fabric and imparting a softness thereto, characterised by contacting the fabric with an aqueous solution of a composition according to any of claims 1-8, in a concentration effective to result in said washing and softening.

10. A process for preparing a composition according to any of claims 1-8, comprising the steps of:-

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(i) admixture with an aqueous base, of at least some of the non-peptising/non-building electrolyte, and optionally, any builder salt which is non-peptising;

(ii) then admixing therewith, the fabric softening clay material;

(iii) admixing with the product of step (ii), the remainder (if any) of the non-peptising/ non-building electrolyte, and optionally, some or all of the remainder (if any) of any builder salt which is non-peptising;

(iv) admixing with the product of step (iii), the detergent active material; and

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(v) admixing with the product of step (iv), any peptising builder salt and the remainder (if any) of any builder salt which is non-peptising.

11. A process according to claim 10, wherein substantially all of the non-peptising/non-building electrolyte is incorporated in step (i).

12. A process according to claim 10 or claim 11, wherein the aqueous base comprises substantially only water.

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13. A process according to any of claims 10-12 wherein water is incorporated as a further step immediately preceding step (iv) so that the water and the aqueous base incorporated in step (i), together comprise the aqueous base according to claim 1.

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Fig. 1.

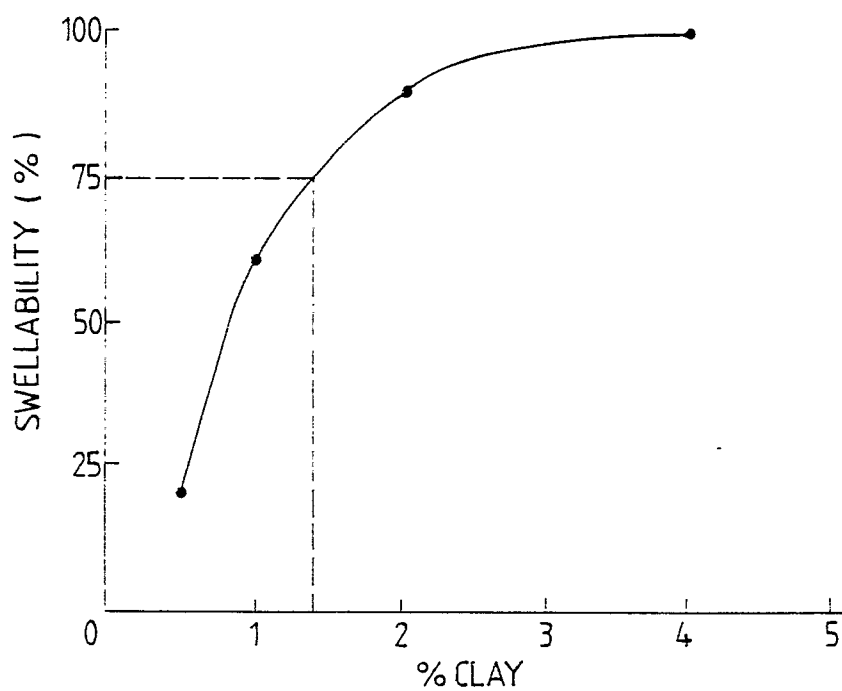


Fig. 2.

