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(71) Applicants *(for all designated States except US)*: **UNIVERZITA PARDUBICE** [CZ/CZ]; Studentska 95, 532 10 Pardubice (CZ). **LOUFAKIS CHEMICALS S.A.** [GR/GR]; Industrial Area of Sindos, P.O.Box 6, GR-574 00 Sindos (GR). **CLOTEFI S.A.** [GR/GR]; Eleftheriou Venizelou 4, GR-176 76 Kalithea (GR).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **HRDINA, Radim** [CZ/CZ]; Polska 529, 530 03 Pardubice (CZ). **BURGERT, Ladislav** [CZ/CZ]; Jindrisska 2040, 530 02 Pardubice (CZ). **HRDINOVA, Marcela** [CZ/CZ]; Polska 529, 530 03 Pardubice (CZ). **ANDROVA, Jana** [CZ/CZ]; Na Okrouhliku 919, 530 03 Pardubice (CZ). **DUSEK, Libor** [CZ/CZ]; Strojaru 1388, 537 01 Chrudim (CZ). **DOLNIK, Martin** [SK/SK]; Konska 287, 013 13 Rajecke Teplice (SK). **LOUFAKIS, Kyriakos** [GR/GR]; Dasyliou Str. 10, GR-555 35 Pylea, Thessaloniki (GR). **KOUKIOTIS, Christos** [GR/GR]; Papadiamanti 72, GR-564 29 Nea Efkarpia (GR). **LOUTSOPOULOU, Eleni** [GR/GR]; K. Karamanli 73, GR-563 34 Eleftheria-kordelio (GR). **BOUTRIS, Kostas** [GR/GR]; Antoniou Tzanetou 11, GR-173 43 Aghios Demetrios (GR). **MALLIOU, Nena** [GR/GR]; Noti Botsari 2, GR-117 41 Athens (GR).

(74) Agent: **GABRIELOVA, Marta**; Inventia s.r.o., Na Beli-dle 3, 150 00 Praha 5 (CZ).

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(54) Title: LIPOSOME OF A TEXTILE AUXILIARY AGENT, METHOD OF ITS PREPARATION AND A PREPARATION CONTAINING IT

(57) Abstract: The invention concerns the liposome of textile auxiliary agent consisting of a solid nucleus formed by a textile auxiliary agent and of a membrane formed by a phospholipid and optionally by a surfactant, cholesterol and/or water-soluble polymer of cationic type, wherein the content of the textile auxiliary agent referenced to the total weight of the liposome is in the range of 80-99.5 % wt., the content of the phospholipid is in the range of 0.5-20 % wt., the content of cholesterol is up to 19.5 % wt., the content of the surfactant is up to 19.5 % wt., the content of the water-soluble polymer of cationic type is up to 19.5 % wt., whereas the liposome is a solid particle. The textile agent is a salt or a dispersant. The invention further concerns a method of preparation of the liposomes of textile auxiliary agent and a preparation containing these liposomes.

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Liposome of a textile auxiliary agent, method of its preparation and a preparation containing it

Technical Field

The invention relates to liposomes of textile auxiliary agents, method of their preparation and preparation containing these liposomes, which is particularly suitable as an additive to dyeing baths.

Background Art

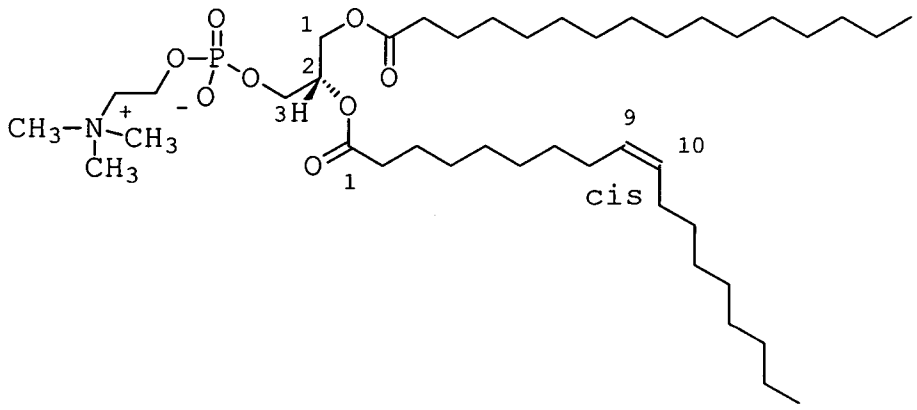
The micro-encapsulation technology, i.e. the preparation of micro-capsules (vesicles, cells), is extensively utilised in a number of industrial branches, especially in agriculture, medicine and cosmetics. Also the textile industry is a branch where a number of innovative ideas are appearing. The micro-encapsulation is a process in which very small droplets or solid particles are coated with a continuous film. The size of capsules usually varies from 2 μm to 2000 μm. The thickness of the capsule wall is usually 0.5 μm to 150 μm, but also thinner ones have been measured. The proportion of the mass of the core in the overall mass of the capsule is 20-90 %. The micro-encapsulation technology is used to achieve various results: transformation of liquids or dispersions into solid substances, separation of reactive components, protection of the encapsulated material, improvement of systems of exchange of materials, control of release of materials (active components), improvement of stability, taste-masking etc. The extent of commercial technologies of micro-encapsulation falls into five different categories:

1. Spraying coating methods, e.g. the Würstr coating
2. Separation of phases, membrane separation
3. Reactions at phase interfaces
4. Physical processes, e.g. jet encapsulation
5. Solidification of application matrices, e.g. spraying drying

A special category is the encapsulation into liposome systems. In this case, the encapsulation material is a natural substance called lecithin, that is a substance used in

foodstuff, cosmetics and pharmaceutical industries, which is harmless for health, environmentally friendly and cheap. The encapsulation into liposome systems is applicable to both liquids and solids, and is universal, i.e. it encapsulates both water soluble substances and water insoluble ones. In biochemical literature, the term lecithin is used as the trivial name for 3-*sn*-phosphatidylcholines. American Oil Chemists Society gives the following definition: lecithin is a mixture of glycerolphospholipids obtained from plant, animal or microbial sources, containing a number of substances, such as sphingosylphospholipids, triglycerides, fatty acids and glycolipids.

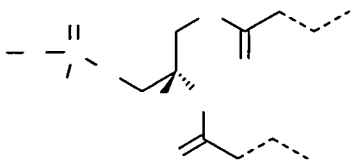
Liposomes are particles in which certain volume - the core - is surrounded by a membrane consisting of molecules of a lipid, usually phospholipid. After dispersing the lipid in an aqueous medium, the liposomes are formed spontaneously and have diameters from nanometers to micrometers (*Liposomes, A Practical Approach,* Edited by R. R. C. New, Oxford University Press, 1997). Molecules of phospholipids contain a hydrophilic part and a hydrophobic part. The hydrophilic part (a polar group) is formed by phosphate and e.g., choline groups. The hydrophobic part is formed by two hydrocarbon chains, esters of fatty acids, wherein in the natural phospholipids one chain contains double bond, while the other is fully saturated. An example is phosphatidyl choline:

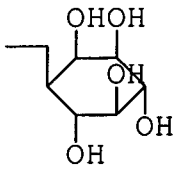


1-palmitoyl-2-oleyl-*sn*-glycero-3-phosphocholine (POPC)

The polar group can be phosphocholine, ethanolamine, serine, glycerol etc., and the exact composition depends upon the source of the respective phospholipid. The hydrophobic moiety is formed by fatty acids such as palmitic, stearic, oleic, linoleic acid etc. (Table 1).

Table 1. Examples of phospholipids



Substituent X	Phospholipid (abbreviation)
$-CH_2CH_2N^+(CH_3)_3$	phosphatidylcholine (PC)
$-CH_2CH_2\overset{+}{N}H_3$	phosphatidylethanolamine (PE)
$-CH_2\underset{\overset{\vert}{NH_3^+}}{\overset{\vert}{C}}H-COOH$	phosphatidylserine (PS)
H	phosphatidyl acid (PA)
	phosphatidylinositol (PI)

The compounds of this type are called amphiphilic compounds, and a schematic representation of such compound for the purposes of the following text and/or figures is given in Fig. 1.

In contrast to many other systems, in this case a polymeric film is not produced around the core; instead of it, the coating consists of spatially oriented molecules of

phospholipids, i.e. a membrane the constituents of which are held together by means of hydrogen bonds and van der Waals forces (Fig. 2).

The double bonds in phospholipids bring with them slightly anti-oxidising effects. However, their easy oxidation results in their colour turning yellow and finally in their destruction. That is why hydrogen-saturated (hydrogenated) phospholipids (e.g., hydrogenated lecithin) are manufactured; these derivatives are snow-white and also more stable (in chemical context this means that they do not undergo oxidative destruction so easily).

Liposomes are formed in water due to the tendency of the amphiphilic molecules to create aggregates in which the hydrophobic moiety has a minimum contact with the polar solvent, i.e. water.

While surfactants (tensides, e.g. sulphated aliphatic alcohols), which have only one hydrophobic chain on the polar group, easily form monolayer micelles in the water, the phospholipids, probably due to the presence of two hydrocarbon chains in their molecule, can create a number of structures depending on the "water concentration": the lamellar and the non-lamellar ones. At a low concentration of water, the phospholipid forms aggregates which, with an increasing water concentration (gradual dilution), change into lamellar structures and finally to liposomes. The classical monolayer micelles can only be formed at very large dilution. Liposomes can form one layer (one double layer) or several layers (several double layers) depending on the method of their preparation.

Generally, in principle the preparation of liposomes does not much depend upon the chemical structure of the amphiphilic molecules. However, what has to be fulfilled is the requirement that the temperature of the preparation of the liposomes must be 5-10 °C higher than the main phase transition temperature (T_m). Below this temperature the hydrocarbon chains assume a rigid conformation similar to the crystal state (gel). Above the T_m temperature, the hydrocarbon chains are "loosened" (liquid crystal), which makes it possible to mechanically prepare (dispersing by stirring, ultrasound etc.) the lipid double layer (membrane). As a rule, the longer and the more saturated

(i.e. with the double bonds hydrogenated) the hydrocarbon chains are, the higher is the T_m temperature.

For instance, 1-palmitoyl-2-oleyl-*sn*-glycero-3-phosphocholine (POPC) has the T_m temperature of about -2.5 ± 2.4 °C. Practically important are the following data summarised in Table 2.

Table 2. The main lamellar temperature of transition for selected phosphatidylcholines

Phosphatidylcholine	**T_m (°C)**
from eggs	-5.8 ± 6.5
from soya	-15 ± 5
hydrogenated from soya	51-52

The size of liposomes themselves ranges from 20 nm to micrometers, four main categories being generally differentiated (Table 3).

Table 3. Types of liposomes

Type	**Name**	**Size [nm]**	**Note**
SUV	Small Unilamellar Vesicles	20-50	
LUV	Large Unilamellar Vesicles	150-500	
MLV	Multilamellar Vesicles	150-500	More than 5 layers
OLV	Oligo-Lamellar Vesicles		Smaller than MLV

The type of the liposome formed depends upon the preparation method adopted. A survey of preparation methods is presented in the review article (P. Walde, S. Ichikawa, *Enzyme inside lipid vesicles: preparation, reactivity and applications*, Biomolecular Engineering **18** (2001), 143-177) or encyclopaedia (P. Walde: *Preparation of Vesicles (Liposomes),* Encyclopaedia of Nanoscience and Nanotechnology (2004), **9**, 43-79).

The preparation methods can be classified into four basic categories.

1. The methods starting from a "dry" lipid film. These methods of the preparation of lipids include three or four basic steps: "drying down" (drying upon the wall of vessel) the phospholipids from an organic solvent, dispersing phospholipids

in an aqueous medium, purification of the liposomes formed, i.e. their separation from the medium, and eventually the analysis, and then, of course, their application. Because of the application, it is very often appropriate to obtain (as far as possible) liposomes of a uniform size, hence the preparation of liposomes is followed by membrane filtration.

2. The methods starting from a micro-emulsion containing a water-immiscible solvent.
3. The methods starting from a water-surfactant system, i.e. they include an application of a surface active substance that is being incorporated into the lipid membrane (surfactant-lipid mixed membrane) and which is separated from the resulting liposomes, e.g., in dialysis.
4. Methods based on mixing non-aqueous solutions of lipids (in ethanol, ether etc.) with aqueous solutions.

A technique of the so-called "pro-liposome" is used in order to increase the surface of the phospholipid on the wall of the vessel: the phospholipid is dried from an organic solvent (usually chloroform) on the surface of finely ground sodium chloride or sorbitol. The drawbacks are obvious: the use of organic solvents and the irregularity of the pro-liposome formed due to the distribution and shape of the particles of the carrier, which then results in difficult preparation of the uniform-size liposomes.

Lucas Meyer Comp. launched a product (described in EP 0 158 441 A2), which is a so-called "pro-liposome" composition (in the form of lamellar structures), that is a mixture of water, lecithin, and a water-miscible solvent, e.g. ethanol. Liposomes are then formed by pouring this mixture into water, i.e. by further dilution.

Lecithins, i.e. generally amphiphilic compounds (lipids) can encapsulate both water-soluble and water-insoluble compounds.

The simplest case is the encapsulation of hydrophobic water-insoluble substances, such as fats, oils etc. The encapsulation process is as follows: First, the compound to be encapsulated is mixed with distilled water (5-20 % of the water weight) to form a very fine dispersion (or micro-emulsion). This can be achieved by using suitable types of agitators as well as ultrasound. Then, with intensive stirring, lecithin (e.g., soybean) is slowly and gradually added in the amount of ca 2-10 % of the substance to be

encapsulated. The mixture is not heated, because T_m = –15 °C. After all the lecithin has been added, the intensity of the stirring must be reduced, and the slower stirring is continued for another ca 10 min. In this way, almost all the material is encapsulated, and the liposomes have the appearance shown in Fig. 3. The hydrophobic compound is inside the capsule and is also incorporated in the membrane (double layer), either as a lens between the two layers or directly between the hydrocarbon chains of an individual molecule (cholesterol is incorporated similarly in natural cells).

If we want to prepare large unilamellar vesicles (LUV), we usually have to adopt the following technique: first, e.g. purified egg lecithin (eluent chloroform/methanol = 2:1) is placed on the wall of a rotary evaporator by evaporation of the solvent under nitrogen atmosphere, which results in the formation of a thin film. Then, ethyl ether is added to obtain a solution, into which the aqueous dispersion of the substance to be encapsulated is added with stirring and the application of ultrasound. The stirring is continued for about 20 min, after that the organic solvent is again removed by evaporation with stirring in vacuum; then the suspension of liposomes can be extruded, e.g., through a 400 nm polycarbonate membrane.

Substantially more complex is the encapsulation of hydrophilic water-soluble compounds (both of anionic and of cationic nature). In this case, only a certain amount of the compound is encapsulated, while the rest remains in the solution outside the liposomes. The visual aspect of liposomes is shown in Fig. 4. The formation of ionic bond between the polar group of the lecithin and the substance encapsulated results in that the "concentration" of the encapsulated substance in the liposome is higher than that of the free substance in the "outer" solution.

If we want to prepare LUV in this case, too, we usually have to adopt the following technique: first, e.g. purified egg lecithin (eluent chloroform/methanol = 2:1) is placed on the wall of a rotary evaporator by evaporation of the solvent under nitrogen atmosphere, which results in the formation of a thin film. Then, ethyl ether is added to obtain a solution, to which the aqueous dispersion of the substance (e.g., dyestuff) to be encapsulated is added with stirring and the application of ultrasound. The stirring is continued for about 20 min, after that the organic solvent is again removed by stirring in vacuum. Then the suspension of liposomes can be extruded through a 400 nm

polycarbonate membrane (Table 4). (Gomes J.I.N.R, Genovez M.C., Hrdina R., Textile Res. J **67**(7), 537-541 (1997)).

Table 4. Diameter of the liposomes formed

Concentration of lecithin in water	Ultrasound (50 W)	Mechanical stirring
0.5 g/dm^3	377 ± 55 μm	462 ± 55 μm

The above-given procedure is very suitable, e.g., for dyeing animal substrates (wool, leather) with dyestuffs that exhibit a too high affinity for the substrate dyed, and the dyeing process has to be retarded to achieve the diffusion of the dyestuff into the fibre. Generally, the rate of the release of the dyestuff from the capsule into the outer solution (dyeing bath) can be controlled by means of the temperature—a temperature increase accelerates the release of the dyestuff into the dyeing bath—or also by the addition of, e.g., a non-ionic surfactant, such as Triton X100 (oxyethylated alkylphenol). As a rule, on reaching a certain concentration of the surfactant all the liposomes are destroyed.

Multilamellar vesicles (MLV) are generally prepared by dissolving the lipid in an organic solvent, evaporation of the latter, formation of a thin film on the wall of the vessel and, finally, addition of an aqueous solution of the substance to be encapsulated. The obtained liposomes are 30 microns in diameter and the amount of the encapsulated substance is low (below 20 %). The liposomes can be subjected to the action of ultrasound (sonicated), which decreases their diameter but does not increase the amount of the encapsulated substance.

An intensive action of ultrasound upon MLV can even produce small unilamellar vesicles (SUV) with a diameter of 20-50 nm. They can be also obtained by fast injecting ethanolic solution of a lipid (the maximum concentration of lipid is 3 %) into an aqueous phase. However, the encapsulated amount is so small (about 1 %) that the method is virtually useless in the industry.

In this respect, other techniques are similar. Therefore, the already mentioned Company Lucas Meyer introduced a procedure in which the encapsulated substance is first mixed with the so-called "pro-liposome" (lecithin in lamellar structures) and then

the thus obtained mixture is diluted with water under vigorous stirring. The dilution produces multilamellar vesicles (MLV) in which, however, the amount of the encapsulated substance is much higher.

The affinity of the liposomes for various materials is controlled by the electrostatic charge at the outer surface of the membrane, i.e. ZETA potential that is established in the given medium. The liposomes formed from phosphatidylcholines should be electrically neutral (have zero electrostatic charge at their surface). Negatively charged liposomes can be prepared by the addition of negatively charged amphiphilic compounds (dicetyl phosphate is a typical example), while positively charged liposomes can be prepared by the addition of positively charged amphiphilic compounds (octadecylamine is an example, and dioctadecyldimethylammonium bromide is an even better example). The magnitude of ZETA potential also affects the stability of dispersion. It is claimed that the liposomes with ZETA potentials above ca +30 mV or below ca –30 mV tend rather to mutual repulsion than to aggregation, and the dispersions of the liposomes having such charges are stable.

The mechanical properties of the membrane are usually affected by the addition of cholesterol, which influences the organisation of the lipid double layer (McMullen T.P.W., McElhaney R.N., Biochim. Biophys. Acta, 1234(1995), 90-98).

In the dyestuff chemistry, or to be more precise, in the textile applications, the lecithins were predominantly applied to the encapsulation of disperse dyes for dyeing polyester and wool. Barni *et al.* reported dyeing of polyester in which he had achieved a faster migration of the dyestuff and good uniformity of dyeing (E. Barni *et. al.*, J. Dispersion Sci. Technol., 9(1), (1988), 75-97).

The liposomes were also investigated in the applications to wool dyeing. In this respect the pioneering work was done by Maza *et al.* (Maza *et al.*, JSDC Vol. 108, December 1992), as well as by Genovez *et al.* (Genovez *et al.*, Colorchem 94, 1994; J. I. N. R. Gomes, M. C. Genovez, R. Hrdina: *Controlling Exhaustion of Reactive Dyes on Wool by Micro-Encapsulation with Liposomes,* Textile Res. J. 67(7) (1997) 537-541), who proved that the liposome systems can be adopted in wool dyeing not only with acid dyes (because phospholipids increase the adsorption forces and are, therefore, excellent carriers of the dyestuffs), but also with disperse dyes. Wool

dyeing with disperse dyes usually suffers from either bad migration of the dyestuff to the surface or, on the other hand, uneven dyeing. The encapsulation of the disperse dye into phospholipids enabled easy and uniform dyeing of wool.

The preparation of the liposome capsules for use in dyeing with acid dyestuffs was described by Bangham (A. D. Bangham, M.M. Standish and J. C. Watkins, J. Mol. Biol., 13 (1965) 238) and made use of by Maza. The method consists in the formation of a lipid film: egg phosphatidylcholine was dissolved in chloroform, the solution was transferred into a rotary evaporator, and the solvent was distilled off under reduced pressure in nitrogen atmosphere to form a film on the surface of flask. The solution of Acid Blue 90 (1 %), sodium sulphate (5 %) and acetic acid (to adjust pH 5.5) was added to the film together with porcelain balls, and the content was thoroughly mixed. The resulting milky suspension was filtered through a polycarbonate membrane to obtain particles of uniform size. By this method, he prepared multilayer micro-capsules with 400-nm particles.

A method of preparation of monolayer-type micro-capsules was described by Paternostre and Rigaud (J. L. Rigaud, A. Bluzar and S. Buschlen, Biochem. Biophys. Res. Commun., 111 (1983) 373; M. T. Paternostre, M. Roux and J. L. Rigaud, Biochem., 27 (1988) 2668), who started from the general method of preparation described by Szoka and Papahadjopoulos (F. Szoka and D. Papahadjopoulos, Proc. Nat. Acad. Sci. USA, 75 (1978) 4194). This procedure differs from the previous one in that the phospholipids film is first dissolved in ether, and then the aqueous solution of the dyestuff is added. The two-phase system is treated with ultrasound, after that ether is evaporated in a rotary evaporator under reduced pressure in nitrogen atmosphere, and the residue is filtered.

In the course of the dyeing process, the micro-capsules are gradually opened by heat, which in principle means displacing the equilibrium between the encapsulated dyestuff and the free one. This technique of opening is applied in the dyeing processes with disperse dyes. If it is desirable to release all the dyestuff or its certain part in dye bath before the dyeing of the substrate, a non-ionic surfactant is added to destroy all the capsules or a part of them (F. Szoka *et al.*, Biochim. Biophys. Acta, 601 (1980) 559).

A special paragraph is dedicated to the already twice-mentioned work by Genovez *et al.*, who used the liposome system for the encapsulation of reactive dyes of the Lanasol type (α-bromoacrylamidic reactive group) for use in wool dyeing. They compared the results of wool dyeing with Lanasol Red 2R, either encapsulated or non-encapsulated, and also investigated the optimum ratio of the dye to the liposome; moreover, they varied the factors of this wool dyeing in order to find out the optimum dyeing conditions.

For the liposome system they first used the egg lecithin (Merck), from which they obtained phosphatidylcholine by dissolving the lecithin in a chloroform-methanol mixture (2:1) and passing the solution through a column packed with Silica gel 60 (Fluka), which removed the sticky components. The solution was then transferred to a rotary vacuum evaporator and the organic solvent was evaporated to yield a film on the walls of the flask. This film was re-dissolved in diethyl ether, after that the aqueous phase was added which contained 1 % of the reactive dyestuff Lanasol Red 2R, 10 % of sodium sulphate, and acetic acid to adjust to pH 5. The two-phase system was then subjected to the treatment with ultrasound (5 min; 50 W), and the ether solvent was evaporated in a rotary evaporator. The residue was thoroughly mixed and filtered through a membrane (Schleicher, Schuell – 400 nm). The thus obtained solution (suspension of particles) was used directly in wool dyeing. Furthermore, they prepared liposomes by the same method, but without the purification of phosphatidylcholine in the column. The wool dyeing was performed in usual way, i.e. by pouring the dyeing system (0.1 g dyestuff/dm^3; 0.5 % with respect to the weight of wool) into the dye bath, heating to 40 °C, and inserting the wool (the bath/wool ratio was 50/1). The temperature was raised to 95 °C, kept for 60 min, and left to drop to the room temperature. The following findings were obtained from the results of the dyeing experiments. There was no difference between the experiments with and without the purification of phosphatidylcholine, which is an important finding with regard to the encapsulation of dyestuffs on a commercial scale. As regards the dye/lecithin ratio and the effect of this ratio on wool dyeing, it was found that - with all the dye being encapsulated - a level dyeing and satisfactory fixation of the dyestuff to the fibre (by a covalent bond) needed the addition of a non-ionic surfactant (Triton X100, Fluka) in the course of the dyeing procedure, namely in the 30^{th} minute of the dyeing process. If not all the dyestuff was encapsulated, i.e. there was a dynamic

equilibrium in the dye bath between the dyestuff inside the capsules and the "free" dyestuff at the beginning, then it was not necessary to add Triton X100 during the dyeing process, because the dyeing process (or, to be more precise, the process of dyestuff fixation) was continuously displaced.

A review article on the applications of the liposomes to wool dyeing was published by Sekar (N. Sekar, Colourage (1999), **46**(4), 37-38). Also Coderch *et al.* reported the applications of the liposomes to wool dyeing and in particular the dyeing of wool/polyester mixtures. (L. Coderch *et al.*, Recent Research Developments in Oil Chemistry (1997), **1**, 17-29).

The textile auxiliary agents are used in the dyeing of textile fibres and textiles. The textile auxiliary agent added to the dye bath is an electrolyte (salt) in the cases of dyeing of the fibres made from native and regenerated cellulose with direct dyes, reactive dyes, vat dyes, sulphur dyes and insoluble azo dyes, in dyeing of wool with acid and metal-complex dyes of all classes, mordant dyes and reactive dyes, in dyeing of synthetic polyamides with acid dyes, reactive dyes and metal-complex dyes of all classes, and in dyeing of anion-modified poly(acrylonitriles) with cationic dyestuffs. The textile auxiliary agent added to the dye bath is a dispersant in the case of dyeing of hydrophobic fibres, e.g., synthetic polyesters, with disperse dyes.

The basic disadvantage of the present procedures of the encapsulation of the dyestuffs into the liposome system lies in the fact that the encapsulation of the dyestuff must be carried out by its manufacturer or by the dyer of the respective goods; however, it must be taken into account that the process is extremely demanding and basically impracticable in ordinary dye works. This drawback is eliminated by the present invention.

Disclosure of Invention

Object of the present invention is a liposome of textile auxiliary agent consisting of a solid nucleus containing a textile auxiliary agent and a membrane containing a phospholipid and optionally cholesterol, a surfactant and/or a water-soluble polymer of cationic type, wherein the content of the textile auxiliary agent referenced to the total weight of the liposome is 80-99.5 % wt., the content of the phospholipid is 0.5-20 % wt., the content of cholesterol is up to 19.5 % wt., the content of the surfactant is

up to 19.5 % wt., and the content of the water-soluble polymer of cationic type is up to 19.5 % wt., whereas the liposome is a solid particle.

It is an aspect of the invention that the textile auxiliary agent is selected from the group comprising salts and dispersants.

The use of a spray drier allows the preparation of encapsulated inorganic salt, organic salt or dispersant, i.e. the liposomes of the textile auxiliary agent with the lipid membrane and with a narrow distribution curve of their sizes, and without using organic solvents. The salts present in the dye bath affect not only the ionic strength but also the pH of the dye bath. The diameter of the resulting liposomes depends upon the concentration of the compounds in water and upon the size of the drops formed at the top of the spray drier.

In a preferred empodiment of the present invention, the liposome of textile auxiliary agent contains 0.5-10 % wt. of phospholipid.

Another aspect of the invention is that the phospholipid is lecithin. Preferably, the lecithin is selected from the group comprising rapeseed, egg or soya lecithin. The lecithin can be hydrogenated. Also synthetic lecithins, e.g., dipalmitoylphosphatidylcholine, can be used.

It is an aspect of the invention that the salt is selected from the group comprising sodium chloride NaCl, ammonium sulphate $(NH_4)_2SO_4$, sodium sulphate Na_2SO_4, ammonium chloride NH_4Cl, sodium citrate $Na_3C_6H_5O_7$, sodium carbonate Na_2CO_3, sodium hydrogencarbonate $NaHCO_3$, sodium dihydrogenphosphate NaH_2PO_4, sodium hydrogenphosphate Na_2HPO_4, sodium phosphate Na_3PO_4 and their hydrates.

It is a further aspect of the invention that the dispersant is selected from the group comprising sodium naphthalenesulphonate, sodium lignin-sulphonate, water-soluble poly- and oligo-saccharides of anionic, non-ionic and cationic types, such as carboxymethyl cellulose, sodium salt of carboxymethyl cellulose, hydroxyethyl cellulose, carboxymethyl starch, sodium salt of carboxymethyl starch, hydroxyethyl starch, oxidized starch, dispersants on the basis of water-soluble vinyl polymers and/or co-polymers of anionic, non-ionic and cationic types, such as sodium salt of poly(acrylic acid), sodium salt of hydrolysed poly(maleic anhydride), sodium salt of

co-polymer of acrylic acid and hydrolysed maleic anhydride, amidated and imidated poly(maleic anhydride), its co-polymers and quaternised derivatives, poly(vinyl alcohol) and its co-polymers with maleic anhydride and/or acrylic acid.

Preferably, the dispersant is selected from the group comprising sodium naphthalenesulphonate and sodium salt of carboxymethyl cellulose.

The surfactants are optionally added to the phospholipid because during drying in the spray drier, the surfactant is incorporated into the membrane and thus affects the properties of this membrane, particularly its surface potential and electrokinetic ZETA potential.

The water-soluble polymers of cationic type without the surface activity are optionally added to the phospholipids because they shift the surface potential and electrokinetic ZETA potential of the membrane towards positive values.

Depending upon the required application, anionic, cationic, amphoteric or non-ionic surfactants can be used as the surfactant.

The anionic surfactants used can be, e.g., salts of fatty acids, sulphated fatty alcohols, sulphated oxyethylated fatty alcohols, sulphated ethanolamides of fatty acids, alkylarylsulphonates, esters of phosphoric acid and fatty alcohols or their ethoxylated derivatives etc.

The cationic surfactants used can be quaternary ammonium or pyridinium compounds etc. We have found out that the positive electrokinetic potential is presumably only provided by the compounds possessing a permanent positive charge – quaternary ammonium salts or low-molecular cationic tensides, soluble in water.

The amphoteric surfactants used can be, e.g., compounds of the betaine type.

The non-ionic surfactants used can be oxyethylenated fatty alcohols, oxyethylenated fatty acids, oxyethylenated alkylphenols, oxyethylenated fatty amines, alkanolamides of fatty acids or their oxyethylenated derivatives, oxyethylenated methyl esters of fatty acids, block co-polymers of oxirane and methyloxirane and also non-ionic compounds the polar moiety of which is represented by mono- to oligo-saccharides (alkyl glycosides etc.) etc.

Preferably, oxyethylenated fatty alcohol, oxyethylenated alkylphenol, oxyethylenated quaternised fatty amine, quaternary ammonium compound and quaternary ammonium compound of the esterquat type can be used as the surfactants.

As the water-soluble polymers of cationic type without the surface activity, water-soluble polymeric compounds with amino group, amide group, or water-soluble polymeric compounds containing secondary, tertiary or quaternary nitrogen atom can be used. The addition thereof also shifts the electrokinetic potential of the liposome towards positive values.

Preferably, poly(vinylpyrrolidone) and poly(dimethyldiallylammonium bromide) can be used as the water-soluble polymer of cationic type without surface activity.

The potential at the surface of the membrane is affected by the kind of lecithin used and is always negative; the ZETA potential ranges ca from –30 mV to –70 mV. The lecithin used is not purified; it is a crude material as obtained from individual manufacturers. For instance, the liposome of sodium chloride, the membrane of which was prepared from fresh soya lecithin, had the negative ZETA potential of about –30 mV. The liposome of sodium chloride, the membrane of which was prepared from the rapeseed lecithin (one year old), had a ZETA potential of about –62 mV. This is due to the fact that the ageing of lecithin results in the hydrolysis of its ester bonds and the formation of phosphatidyl acid, which increases the absolute value of the negative charge. As already mentioned, the value of the charge can be affected by the addition of the surfactants. When using non-purified lecithin, the positive potential on the surface of the liposome can only be achieved by the addition of compounds having a permanent positive charge.

In one embodiment of the present invention, the value of the potential can be affected by the addition of cholesterol, which is incorporated into the membrane, this shift being from the limiting value towards zero. This fact offers a possibility to adjust the value of the potential to the desired value within certain limits.

This phenomenon is perhaps due to a change in the organisation and the mechanical properties of the membrane. Very advantageous is the addition of cholesterol when employing crude non-purified lecithin, since cholesterol shifts the ZETA potential to

the zero value, which is highly advantageous in its applications to dyeing of hydrophobic fibres.

Another object of the present invention is a method of preparation of the liposomes of textile auxiliary agent of the present invention, the principle of which consists in that in 100 mass units of water, preferably distilled or deionised water, 2 - 40 mass units of the textile auxiliary agent is dissolved, then the phospholipid or its solution or dispersion is added with stirring to the solution of the compound to be encapsulated, after that the milky dispersion formed is dried in a spray drier, where the temperature at the top of the spray drier is 140-170 °C and at the bottom of the spray drier (at the outlet of the liposomes) is 70-110 °C.

In a preferred embodiment of the invention, the phospholipid is, before being added to the solution of the compound to be encapsulated, mixed with a compound selected from the group comprising surfactants, cholesterol, water-soluble polymer of cationic type, or their mixture and the resulting mixture is homogenised.

A further object of the present invention is a preparation based on liposomes, in particular for the addition to dye baths, containing the liposomes of textile auxiliary agent, whereas the preparation is in the form of powder.

Hence, the encapsulated textile auxiliary agent is used for the encapsulation of a water-soluble or water-insoluble compound, e.g., a dyestuff or a pigment, in such a way that first the dye is dissolved in water, resp. the disperse dye or pigment is dispersed in water, after that the liposome of textile auxiliary agent, e.g., salt or dispersant, is added. Since the textile auxiliary agent rapidly diffuses through the membrane, it is gradually dissolved in water. On the contrary, the dyestuff or the pigment, having a large molecule and much lower solubility in water, is displaced from this solution (in the case of water-soluble compounds this process is called salting-out) and subsequently "re-encapsulated" by the molecules forming the membrane. The encapsulated textile auxiliary agent can also be used for increasing the wet fastness properties of dyed textile fibres or textiles, or for removing residual dyestuff from residual dye bath containing the residual dyestuff.

The liposomes of dyestuffs or pigments containing the substances that affect the surface potential and the electrokinetic ZETA potential of the membrane, then possess

the affinity or, on the contrary, repulsive properties against the substrates dyed, depending on the kind of the electrostatic charge. Moreover, these substances affect the rate of release of the dyestuff from the liposome into the substrate dyed, resp. into the surrounding dye baths.

The encapsulated salt, i.e. the liposome of salt, is used as an additive in dyeing of fibres from both native and regenerated cellulose with direct dyes, reactive dyes, vat dyes, sulphur dyes and insoluble azo dyes, in dyeing of wool with acid dyes and metal-complex dyes of all classes, mordant dyes and reactive dyes, in dyeing of synthetic polyamides with acid dyes, reactive dyes and metal-complex dyes of all classes, and in dyeing of anion-modified poly(acrylonitriles) with cationic dyes. The encapsulated dispersant is used as an additive in dyeing of chemical hydrophobic fibres with disperse dyes.

Figures

Figure 1 shows a schematic representation of an amphiphilic molecule.

Figure 2 represents a mono-layer membrane formed by two layers of space-oriented molecules.

Figure 3 is a schematic representation of the encapsulation of a hydrophobic substance.

Figure 4 schematically shows the encapsulation of a hydrophilic dyestuffs of anionic, resp. cationic nature.

Figure 5 represents the distribution curve of the sizes of the liposome particles of sodium chloride LP-1.

Figure 6 represents the photograph of the liposome of sodium chloride LP-1 obtained from electron microscope.

Examples

The ZETA potential of liposome samples was measured in CPN Ltd. Dolní Dobrouč (Zetasizer Nano ZS, model 3600, Malvern Instruments Ltd.) and, eventually, the distribution curve of size of the particles was measured, wherein the disperse medium was water and the liposome concentration was 0.1 $g.dm^{-3}$.

The photograph from the electron microscope was obtained with a JEOL JSM-5500LV apparatus (University of Pardubice). The parameters of the measurement:

accelerating voltage of the primary electron beam 20 kV, pressure in the chamber 20 Pa, representation regime – back-reflected electrons.

Example 1

Liposome of sodium chloride, lecithin membrane (LP-1)

Sodium chloride p.a. (190 g) is dissolved in 1000 cm^3 distilled water. Under stirring, 10 g lecithin is added to the solution (Lecithin RM-50, Milo PLC Olomouc; or Lecigran 5750, Riceland Foods, Inc., Stuttgart, Germany; or Soya lecithin, Ekoprodukt Ltd., Jinačovice, the Czech Republic), and the milky dispersion is dried in the spray drier Büchi 190 (input 2900 W), equipped with a 1.3 mm jet, wherein the conditions of drying are as follows: the temperature at the top of the drier 165-170 °C, temperature at the bottom (at the outlet) 104-107 °C, flow rate in jet inlet 5 $g.min^{-1}$. The yield is 200 g liposome of sodium chloride LP-1.

The ZETA potential depends upon the provenience of the lecithin used: –29.5 mV (soya lecithin from Ekoprodukt Ltd.), –36.7 mV (lecithin RM-50 from Milo PLC, Olomouc), and –61.7 mV (Lecigran 5750 from Riceland Foods, Inc., Stuttgart, Germany).

For illustration, the distribution curve of particle sizes (Fig. 5) and photograph from the electron microscope (Fig. 6) obtained with the lecithin sample from Ekoprodukt Ltd. are shown.

Examples of the application of the liposome of sodium chloride:

Auxiliary preparation for the addition to dye baths for dyeing cellulose fibres with direct dyes, reactive dyes, vat dyes, sulphur dyes. Auxiliary preparation for the addition to dye baths for dyeing wool and synthetic polyamides with acid dyes, metal-complex dyes 1:1 and 1:2 of all classes, and reactive dyes. Auxiliary preparation for the addition to dye baths for polyamides prone to streaky dyeing. Auxiliary preparation for dyeing anionically modified poly(acrylonitriles) with cationic dyestuffs.

Example of dyeing of polyamide prone to streaky dyeing with slightly acid dye:

The following ingredients are added into the bath at the temperature of 40 °C: 2-4 % of ammonium sulphate, 5-10 % of the encapsulated electrolyte LP-1 (lecithin from

Ekoprodukt Ltd.); the textile material is treated in the bath for 5 min, after that the dyestuff is added and the material is treated in the bath for another 5 min. Then within 20-45 min the temperature is raised to 100-125 °C, and the dyeing process continues at this temperature for 60 min. The streakiness is eliminated in contrast to the dyeing process without the encapsulated electrolyte, when the streakiness is present.

Example 2

Liposome of sodium chloride, lecithin membrane, addition of non-ionic tenside Slovasol 359 (LP-2)

Sodium chloride p.a. (300 g) is dissolved in 900 cm^3 distilled water. Then, a solution of 20 g non-ionic tenside Slovasol 359 is prepared in 200 cm^3 water. After the tenside has been dissolved, 10 g soya lecithin (Ekoprodukt Ltd., Jinačovice, the Czech Republic) is added to this solution and converted into emulsion by stirring. The obtained fine emulsion is vigorously stirred at room temperature for 1 hour, after that it is added to the solution of sodium chloride, and the resulting mixture is first stirred for 1 hour and then dried in the spray drier Büchi 190 (input 2900 W) equipped with 1.4 mm jet, wherein the conditions of drying are as follows: the temperature at the top of the drier 150-155 °C, temperature at the bottom (at the outlet) 74-76 °C, flow rate at the jet inlet 3.5 $g.min^{-1}$. The yield is 330 g liposome of sodium chloride LP-2, which exhibits the ZETA potential of –29.5 mV in water (ZETA deviation 9.90 mV).

Examples of application:

Auxiliary preparation for the addition to dye baths for dyeing cellulose fibres with direct dyes, reactive dyes, vat dyes, sulphur dyes. Auxiliary preparation for the addition to dye baths for dyeing wool and synthetic polyamides with acid dyes, metal-complex dyes 1:1 and 1:2 of all classes, and reactive dyes. Auxiliary preparation for the addition to dye baths for dyeing polyamide prone to streakiness. Auxiliary preparation for dyeing anionically modified poly(acrylonitriles) with cationic dyes.

Example of dyeing wool with metal-complex dyes 1:2

The material is treated in the bath containing 2-3 % ammonium sulphate and 10-20 % encapsulated electrolyte LP-2 at the temperatures of 30-50 °C (depending on the strength of the shade) for 15 min. After the addition of a well-dissolved dyestuff, the

bath is brought to a simmer within 45 min, and the dyeing is continued for another 60 min. The resulting shade is more even and stronger as compared with the result obtained without the use of the encapsulated electrolyte.

Example 3

Liposome of sodium chloride, lecithin membrane, addition of dimethyldioctadecylammonium bromide DDDAB (LP-3)

Sodium chloride p.a. (100 g) is dissolved in 300 cm^3 distilled water. Then a mixture is prepared of 5 g soya lecithin (Ekoprodukt Ltd., Jinačovice, the Czech Republic) and 0.5 g DDDAB (Sigma-Aldrich Co.) and a fine emulsion is produced by gradual addition of 100 cm^3 water; the emulsion is vigorously stirred at room temperature for 1 hour and then subjected to the treatment with ultrasound for 15 min. This emulsion is added to the solution of sodium chloride and the resulting mixture is first stirred for 1 hour and then dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.4 mm jet, where the conditions of the drying are as follows: the temperature at the top of the drier 150-155 °C, at the bottom outlet section 75-78 °C, flow rate at the jet inlet 3.5 $g.min^{-1}$. The yield is 105.5 g liposome of sodium chloride LP-3. However, this product contains two types of particles: one with the average ZETA potential of –29.7 mV and the other with the average ZETA potential of –7.55 mV.

Examples of application:

Auxiliary preparation for the fixation of materials dyed with anionic dyes; an auxiliary preparation for the addition to detergents (washing agents – mixtures of tensides and auxiliary substances) which prevents the migration of dyes during washing of dyed textiles; auxiliary preparation for the addition to residual baths after dyeing with anionic dyestuffs which facilitates the removal of residual dyestuffs from dye bath. Auxiliary preparation for the addition to dye baths during dyeing of anionically modified poly(acrylonitrile) with cationic dyes.

Example of fixation after dyeing of cellulose fibres with direct dyes:

The dyed material, in which the wet fastness of dyeing should be increased, is treated in the bath containing (depending upon the required strength of shade) 2-6 %

liposome of sodium chloride LP-3 at the temperature of 30 °C for the period of 20-30 min.

Example 4

Liposome of sodium chloride, lecithin membrane, addition of dimethyldioctadecylammonium bromide (DDDAB) and cholesterol (LP-4)

Sodium chloride p.a. (100 g) is dissolved in 300 cm^3 distilled water. Then, a mixture is prepared from 3 g soya lecithin (Ekoprodukt Ltd., Jinačovice, the Czech Republic), 1 g DDDAB (Sigma-Aldrich Co.) and 1 g cholesterol (Sigma-Aldrich Co.), and by gradual addition of 100 cm^3 water a fine emulsion is produced, which is vigorously stirred at room temperature for 1 hour and then subjected to the treatment with ultrasound for 15 min. This emulsion is added to the solution of sodium chloride and the resulting mixture is first stirred for 1 hour and then dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.4 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 150-155 °C, at the bottom outlet 45-48 °C, flow rate at the jet inlet 3.5 $g.min^{-1}$. The yield is 105 g liposome of sodium chloride LP-4 exhibiting the ZETA potential of –34.5 mV in water (ZETA deviation 4.46 mV).

Examples of application:

Auxiliary preparation for the fixation of textiles dyed with anionic dyes, auxiliary preparation for the addition to detergents (washing preparations – mixtures of tensides and auxiliary substances) preventing the migration of dyes during washing of dyed textiles, auxiliary preparation for the addition to residual baths after dyeing with anionic dyes, which facilitates the removal of residual dyestuff from dye bath. Auxiliary preparation for the addition to dye baths during dyeing of anionically modified poly(acrylonitrile) with cationic dyes.

Example of fixation after dyeing of cellulose fibres with reactive dyes:

The dyed material, in which the wet fastness properties of dyeing should be increased, is treated in the bath containing (depending on the required strength of shade) 2-6 % liposome of sodium chloride LP-4, lecithin membrane, at the temperature of 30 °C for the period of 20-30 min.

Example 5

Liposome of sodium chloride, lecithin membrane, addition of dimethyldioctadecylammonium bromide (DDDAB) and Polyquart FDI (LP-5)

Sodium chloride p.a. (100 g) is dissolved in 300 cm^3 distilled water. Then a solution is prepared from 1 g Polyquart FDI (Cognis Deutschland GmbH & Co. KG) and 100 cm^3 water. After the dissolution of the polymer, 1 g DDDAB (Sigma-Aldrich Co.), and 3 g soya lecithin (Ekoprodukt Ltd., Jinačovice, the Czech Republic) are added. A fine emulsion is formed by vigorous stirring, which is continued at room temperature for 1 hour, and then the emulsion is subjected to the treatment with ultrasound for 15 min. This emulsion is added to the solution of sodium chloride, and the resulting mixture is first stirred for 1 hour and then dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.4 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 150-155 °C, at the bottom outlet 75-78 °C, flow rate at the jet inlet 3.5 $g.min^{-1}$. The yield is 105 g liposome of sodium chloride LP-5.

Examples of application:

Auxiliary preparation for the fixation of textiles dyed with anionic dyes, auxiliary preparation for the addition to detergents (washing preparations – mixtures of tensides and auxiliary substances) preventing the migration of dyes during washing of dyed textiles, auxiliary preparation for the addition to residual baths after dyeing with anionic dyes, which facilitates the removal of residual dyestuff from dye bath. Auxiliary preparation for the addition to dye baths during dyeing of anionically modified poly(acrylonitrile) with cationic dyes.

Example of removal of anionic dyes from residual dye bath:

The liposome of sodium chloride LP-5 (3-6 $g.dm^{-3}$, depending on the amount of residual dyestuff present in bath) is added to the residual dye bath (containing residues of anionic dyestuff) at room temperature. The solution is stirred and the precipitate is left to settle.

Example 6

Liposome of sodium chloride, lecithin membrane, addition of Polyquart FDI (LP-6)

Sodium chloride p.a. (100 g) is dissolved in 300 cm^3 distilled water. Then a solution is prepared from 2 g Polyquart FDI (Cognis Deutschland GmbH & Co. KG) and 100 cm^3 water. After the dissolution of the polymer, 3 g soya lecithin (Ekoprodukt Ltd., Jinačovice, the Czech Republic) is added. A fine emulsion is formed by stirring, which is continued at room temperature for 1 hour, and then the emulsion is subjected to the treatment with ultrasound for 15 min. This emulsion is added to the solution of sodium chloride, and the resulting mixture is first stirred for 1 hour and then dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.4 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 150-155 °C, at the bottom outlet 75-78 °C, flow rate at the jet inlet 3.5 $g.min^{-1}$. The yield is 105 g liposome of sodium chloride LP-6, exhibiting the ZETA potential of + 33.7 mV in water (ZETA deviation 5.2 mV).

Examples of application:

Auxiliary preparation for the fixation of textiles dyed with anionic dyes, auxiliary preparation for the addition to detergents (washing preparations – mixtures of tensides and auxiliary substances) preventing the migration of dyes during washing of dyed textiles, auxiliary preparation for the addition to residual baths after dyeing with anionic dyes, which facilitates the removal of residual dyestuff from dye bath. Auxiliary preparation for the addition to dye baths during dyeing of anionically modified poly(acrylonitrile) with cationic dyes.

Example of fixation of textile fibres after dyeing with anionic dyestuffs:

The dyed material, in which the wet fastness properties should be increased, is treated in the bath that contains (depending upon the strength of the shade) 2-6 % liposome of sodium chloride LP-6 at the temperature of 30 °C for the period of 20-30 min.

Example 7

Liposome of sodium chloride, lecithin membrane, addition of Triton X100 (LP-7)

Sodium chloride p.a. (100 g) is dissolved in 300 cm^3 distilled water. Then a solution is prepared from 5 g Triton X100 (Sigma-Aldrich Co.) and 100 cm^3 water. After the dissolution of the tenside, 5 g soya lecithin (Ekoprodukt Ltd., Jinačovice, the Czech Republic) is added. A fine emulsion of lecithin in the tenside is formed by stirring,

which is continued at room temperature for 1 hour, and then the emulsion is subjected to the treatment with ultrasound for 15 min. The emulsion thus prepared is slowly poured into the solution of sodium chloride with stirring, and the mixture is then dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.5 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 160-165 °C, at the bottom outlet 82-85 °C, flow rate at the jet inlet 5 $g.min^{-1}$. The yield is 110 g liposome of sodium chloride LP-7.

Examples of application:

Auxiliary preparation for the addition to dye baths for dyeing cellulose fibres with direct dyes, reactive dyes, vat dyes, sulphur dyes. Auxiliary preparation for the addition to dye baths for dyeing wool and synthetic polyamides with acid dyes, metal-complex dyes 1:1 and 1:2 of all classes and reactive dyes. Auxiliary preparation for the addition to dye baths for dyeing polyamide prone to streaking. Auxiliary preparation for the addition to dye baths for dyeing of anionically modified poly(acrylonitrile) with cationic dyes.

Example of wool dyeing with slightly acidic dyes

The material is treated in the bath containing 2-3 % ammonium sulphate, 10-20 % encapsulated electrolyte LP-7 for the period of 15 min at the temperatures of 30-50 °C (depending on the required strength of the shade). After the addition of well-dissolved dyestuff, the bath is brought to a simmer, and the dyeing process is continued for the period of 60 min. The result is a more even (uniform) and deeper shade in comparison with the result obtained with the use of non-encapsulated electrolyte.

Example 8

Liposome of sodium chloride, lecithin membrane, addition of Syntegal V 20 (LP-8)

Sodium chloride p.a. (100 g) is dissolved in 300 cm^3 distilled water. Then a solution is prepared from 6.66 g Syntegal V 20 and 100 cm^3 water. After the dissolution of the tenside, 3.33 g soya lecithin (Ekoprodukt Ltd., Jinačovice, the Czech Republic) is added, and the lecithin is homogenised to produce a fine emulsion, which is vigorously stirred at room temperature for 1 hour, and then the emulsion is subjected to the treatment with ultrasound for 15 min. The emulsion thus prepared is slowly

poured into the solution of sodium chloride with stirring, the resulting mixture is first stirred for 1 hour and then dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.5 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 165-170 °C, at the bottom outlet 105-107 °C, flow rate at the jet inlet 5 $g.min^{-1}$. The yield is 110 g liposome of sodium chloride LP-8, which exhibits the ZETA potential of –28.4 mV in water (ZETA deviation 4.90 mV).

Examples of application:

Auxiliary preparation for the addition to dye baths for dyeing wool and synthetic polyamides with acid dyes, metal-complex dyes 1:1 and 1:2 of all classes and reactive dyes. Auxiliary preparation for the addition to dye baths for dyeing polyamide prone to streaking. Auxiliary preparation for dyeing of anionically modified poly(acrylonitrile) materials with cationic dyes.

Example of dyeing polyamide of high affinity

The material is treated in the bath containing 1-2 % encapsulated ammonium sulphate, 1-3 % liposome of sodium chloride LP-8 and dyestuff for the period of 15 min at the temperatures of 30-40 °C (depending on the strength of the shade). Then the bath is brought to a simmer and the dyeing process is continued for 60 min. The resulting shade is more even and deeper than that obtained by dyeing without the use of the encapsulated electrolyte.

Example 9

Liposome of sodium chloride, lecithin membrane, addition of Luwiskol K90 (LP-9)

Sodium chloride p.a. (100 g) is dissolved in 300 cm^3 distilled water. Then a solution is prepared from 2 g Luwiskol K90 (poly(vinylpyrrolidone), BASF) and 100 cm^3 water, and after 30 min stirring, 5 g lecithin is added. After another 1 hour of stirring, the solution of sodium chloride is added, and the mixture is dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.5 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 145 °C, at the bottom outlet 78-80 °C, flow rate at the jet inlet 2.5-3.0 $g.min^{-1}$. The yield is 107 g liposome of sodium chloride LP-9, which, however, contains two types of particles. One exhibits the

ZETA potential of –59.4 mV in water (ZETA deviation 13.0 mV) and the other has the ZETA potential of –1.96 mV (ZETA deviation 4.0 mV).

Examples of application:

Auxiliary preparation for the fixation of textiles dyed with anionic dyes, auxiliary preparation for the addition to detergents (washing preparations – mixtures of tensides and auxiliary substances) preventing the migration of dyes during washing of dyed textiles, auxiliary preparation for the addition to residual baths after dyeing with anionic dyes, which facilitates the removal of residual dyestuff from dye bath. Auxiliary preparation for the addition to dye baths during dyeing of anionically modified poly(acrylonitrile) with cationic dyes.

Example of fixation of cellulose, wool and polyamide fibres dyed with anionic dyes:

The dyed material, in which the wet fastness properties should be raised, is treated in the bath containing 2-6 % liposome of sodium chloride LP-9 (depending on the strength of the shade) at the temperature of 30 °C for the period of 20-30 min.

Example 10

Liposome of sodium chloride, lecithin membrane, addition of cationic-modifying agent Texamin ECE (LP-10)

Sodium chloride p.a. (100 g) is dissolved in 300 cm^3 distilled water. Then a solution is prepared from Texamin ECE (INOTEX, Ltd., Dvůr Králové n. Labem, the Czech Republic) in an amount of 2 g dry matter, i.e. 3.9 g commercial preparation, and 100 cm^3 water, and after 30 min stirring, 5 g lecithin is added. After another 1 hour of stirring, the solution of sodium chloride is added, and the mixture is dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.5 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 165 °C, at the bottom outlet 84-88 °C, flow rate at the jet inlet 4.5-5.0 $g.min^{-1}$. The yield is 107 g liposome of sodium chloride LP-10, which exhibits the ZETA potential of +31.1 mV in water (ZETA deviation 13.0 mV) and the other has the ZETA potential of –1.96 mV (ZETA deviation 7.1 mV).

Examples of application

Auxiliary preparation for the fixation of textiles dyed with anionic dyes, auxiliary preparation for the addition to detergents (washing preparations – mixtures of tensides and auxiliary substances) preventing the migration of dyes during washing of dyed textiles, auxiliary preparation for the addition to residual baths after dyeing with anionic dyes, which facilitates the removal of residual dyestuff from dye bath. Auxiliary preparation for the addition to dye baths during dyeing of anionically modified poly(acrylonitrile) with cationic dyes. If cellulose fibres are pre-treated with this preparation LP-10 by means of padding procedure, the affinity of anionic dyestuffs for the material so treated is increased.

Example of fixation of textile fibres dyed with anionic dyes:

The dyed material, in which the wet fastness properties should be raised, is treated in the bath containing 2-6 % liposome of sodium chloride LP-10 (depending on the strength of the shade) at the temperature of 30 °C for the period of 20-30 min.

Example 11

Liposome of sodium chloride, lecithin membrane, addition of tenside Syntamin AE (LP-11)

Sodium chloride p.a. (100 g) is dissolved in 300 cm^3 distilled water. Then a solution is prepared from Syntamin AE (lubricating tenside, SPOLCHEMIE, Ústí nad Labem, the Czech Republic) in an amount of 2 g dry matter, i.e. 6.3 g commercial preparation, and 100 cm^3 water, and after 30 min of stirring, 5 g lecithin is added. After another 1 hour of stirring, the solution of sodium chloride is added, and the mixture is dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.5 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 160-165 °C, at the bottom outlet 82-85 °C, flow rate at the jet inlet 5.0 $g.min^{-1}$. The yield is 107 g liposome of sodium chloride LP-11, which exhibits the ZETA potential of -31.1 mV in water (ZETA deviation 13.0 mV) and the other has the ZETA potential of –1.96 mV (ZETA deviation 7.6 mV).

Examples of application:

Auxiliary preparation for fixation of textiles dyed with anionic dyes, auxiliary preparation for the addition to detergents (washing preparations – mixtures of tensides

and auxiliary substances) preventing the migration of dyes during washing of dyed textiles, auxiliary preparation for the addition to residual baths after dyeing with anionic dyes, which facilitates the removal of residual dyestuff from dye bath. Auxiliary preparation for the addition to dye baths during dyeing of anionically modified poly(acrylonitrile) with cationic dyes.

Example of fixation of textile fibres dyed with anionic dyes:

The dyed material, in which the wet fastness properties should be raised, is treated in the bath containing 2-6 % liposome of sodium chloride LP-11 (depending on the strength of shade) at the temperature of 30 °C for the period of 20-30 min.

Example 12

Liposome of sodium naphthalenesulphonate (Spolostan 4P), lecithin membrane, addition of Slovasol 359 (LP-12)

Spolostan 4P (SPOLECHEMIE Ústí nad Labem, the Czech Republic) in an amount of 100 g is mixed with 200 cm^3 water during 1 hour. The non-ionic tenside Slovasol 359 (6.66 g) is also dissolved in 200 cm^3 water, and after its dissolution, 3.33 g soya lecithin (Ekoprodukt Ltd., Jinačovice, the Czech Republic) is added and a fine emulsion is prepared by stirring, after that vigorous stirring is continued for about 1 hour. The emulsion thus obtained is slowly poured into the above-mentioned solution of Spolostan 4P with continuous stirring. Finally, the newly formed dispersion is dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.3 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 165-170 °C, at the bottom outlet 104-107 °C, flow rate at the jet inlet 5.0 $g.min^{-1}$. The yield is 110 g liposome of sodium chloride LP-12.

Examples of application:

Auxiliary preparation for the addition to dye baths for dyeing polyamides and polyesters with disperse dyes.

Example of high-temperature dyeing of polyester with disperse dyes:

The bath kept at the temperature of 50-60 °C contains 1 $g.dm^{-3}$ liposome LP-12, 2 $g.dm^{-3}$ ammonium sulphate, and formic acid to adjust to pH 5-5.5. After 10 min, the well-dispersed disperse dye is added and the temperature is raised to 125-130 °C within 30 min. The material is dyed for the period of 60 min. The resulting shade is uniform and deep in contrast to that obtained with the application of a non-encapsulated dispersant.

Example 13

Liposome of sodium naphthalenesulphonate (Spolostan 4P), lecithin membrane, addition of Triton X100 (LP-13)

Spolostan 4P (SPOLECHEMIE Ústí nad Labem, the Czech Republic) in an amount of 100 g is mixed with 300 cm^3 water during 1 hour. Separately, a colloidal solution is prepared by the addition of 5 g soya lecithin (Ekoprodukt Ltd., Jinačovice, the Czech Republic) into the solution of 5 g Triton X100 (Sigma-Aldrich Co.) in 100 g water. This colloidal solution is vigorously stirred for about 1 hour. The solution thus obtained is slowly poured into the above-mentioned solution of Spolostan 4P with continuous stirring. Finally, the resulting solution is dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.5 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 160-165 °C, at the bottom outlet 87-89 °C, flow rate at the jet inlet 4.5 $g.min^{-1}$. The yield is 110 g liposome of sodium chloride LP-13.

Examples of application:

Auxiliary preparation for the addition to dye baths for dyeing polyamides and polyesters with disperse dyes.

Example of dyeing of polyester with disperse dyes assisted by a carrier:

The bath kept at the temperature of 50-60 °C contains 1 $g.dm^{-3}$ liposome LP-13, 2 $g.dm^{-3}$ ammonium sulphate, 1-8 $g.dm^{-3}$ suitable carrier, and formic acid to adjust to pH 5-5.5. After 10 min, the well-dispersed disperse dye is added and the temperature is raised to the boil within 30 min. The material is dyed at the boiling temperature for the period of 60-120 min, depending of the strength of the shade. The resulting shade

is even in contrast to that obtained with the application of non-encapsulated sodium naphthalenesulphonate.

Example 14

Liposome of ammonium sulphate, lecithin membrane (LP-14)

A solution is prepared from 100 g ammonium sulphate p.a. (Sigma-Aldrich Co.) and 300 cm^3 distilled water. Separately, an emulsion is prepared from 5 g lecithin (Lecithin RM-50, Milo PLC, Olomouc, the Czech Republic; or Lecigran 5750, Riceland Foods, Inc. Stuttgart, Germany; or Soya lecithin, Ekoprodukt Ltd., Jinačovice, the Czech Republic) and 100 cm^3 water using vigorous stirring with a magnetic stirrer for the period of 1 hour followed by 15 min treatment in an ultrasonic bath. The emulsion thus obtained is slowly mixed with the above-mentioned solution of ammonium sulphate, and the mixture (while being continuously stirred) is introduced to the drier Büchi 190 (input 2900 W) equipped with a 1.3 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 165-170 °C, at the bottom outlet 104-107 °C, flow rate at the jet inlet 5 $g.min^{-1}$. The yield is 105 g liposome of ammonium sulphate LP-14, which exhibits the ZETA potential of – 57.7 mV in water (ZETA deviation 8.5 mV).

Examples of application:

Auxiliary preparation suitable as an additive to dye bath for the purpose of pH adjustment during dyeing of polyamides and polyesters with disperse dyes, dyeing of wool and polyamide with slightly acid dyes and metal-complex dyes of various classes.

Example of wool dyeing with 1:2 metal-complex dyestuffs:

The woollen material is treated in the bath containing 2-3 % liposome LP-14 for the period of 30 min. The initial bath temperature for dyeing pale shades varies about 30 °C, for deep shades up to 50 °C. After the addition of the well-dissolved dyestuff, the bath is brought to a simmer within 45 min, and the dyeing is continued for another 60 min. The resulting shade is even and deep in contrast with that obtained with the application of a non-encapsulated preparation.

Example 15

Liposome of sodium chloride, lecithin membrane, addition of Polyquart FDI and cholesterol (LP-15)

Sodium chloride p.a. (100 g) is dissolved in 300 cm^3 distilled water. Then a solution is prepared from Polyquart FDI (Cognis Deutschland GmbH & Co. KG) and 100 cm^3 water, and after dissolution, 1 g cholesterol (Sigma-Aldrich Co.) and 1 g soya lecithin (Ekoprodukt Ltd., Jinačovice, the Czech Republic) are added with stirring to produce a fine emulsion, which is further stirred at room temperature for 1 hour and in an ultrasonic bath for 15 min, after that it is dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.5 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 160-165 °C, at the bottom outlet 82-85 °C, flow rate at the jet inlet 5.0 $g.min^{-1}$. The yield is 105 g liposome of sodium chloride LP-15, which exhibits the ZETA potential of +2.69 mV in water (ZETA deviation 7.8 mV).

Examples of application:

Auxiliary preparation for the fixation of textiles dyed with anionic dyes, auxiliary preparation for the addition to detergents (washing preparations – mixtures of tensides and auxiliary substances) preventing the migration of dyes during washing of dyed textiles, auxiliary preparation for the addition to residual baths after dyeing with anionic dyes, which facilitates the removal of residual dyestuff from dye bath. Auxiliary preparation for the addition to dye baths during dyeing of anionically modified poly(acrylonitrile) with cationic dyes. Auxiliary preparation that increases exploitation of anionic dyes in dyeing of cellulose materials.

Example of dyeing of cellulose fibres with reactive dyes:

The dye bath containing the cellulose substrate to be dyed is kept at 30 °C, and 30-120 $g.dm^{-3}$ liposome LP-15 (depending on the required strength of the shade and the character of the reactive dye used) is added, and the mentioned temperature is maintained for 15 min, after that the well-dissolved dyestuff is added and the temperature is increased to the final value (depending on the type of the reactive dye). After reaching this temperature, the respective kind and amount of alkali is added, and the dyeing process is continued at the maximum temperature for the period of 45-90

min (depending on the required strength of shade). The dyeing is followed by washing and soaping. The resulting exploitation of dyestuff is higher than that obtained without the addition of the LP-15 preparation.

Example 16

Liposome of ammonium sulphate, lecithin membrane, addition of Slovasol 359 (LP-16)

Ammonium sulphate p.a. (Sigma-Aldrich Co., 100 g) is dissolved in 300 cm^3 distilled water. Then a solution is prepared from 6.7 g non-ionic surfactant Slovasol 359 and 300 cm^3 water. After the dissolution of the surfactant, 3.3 g soya lecithin (Ekoprodukt Ltd., Jinačovice, the Czech Republic) is added with stirring to produce an emulsion of lecithin in the tenside solution. The fine emulsion produced is stirred with a magnetic stirrer at room temperature for 1 hour and then for another 15 min in ultrasonic bath. The obtained emulsion is slowly mixed with the above-mentioned solution of ammonium sulphate, and while being stirred, it is pumped to the spray drier Büchi 190 (input 2900 W) equipped with a 1.3 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 165-170 °C, at the bottom outlet 104-107 °C, flow rate at the jet inlet 5.0 $g.min^{-1}$. The yield is 110 g liposome of ammonium sulphate LP-15, which exhibits the ZETA potential of –67.3 mV in water (ZETA deviation 8.8 mV).

Examples of application:

Auxiliary preparation suitable as additive to dye bath for the purpose of pH adjustment during dyeing of polyamides and polyesters with disperse dyes, dyeing of wool and polyamide with slightly acid dyes and metal-complex dyes of various classes.

Example of polyamide dyeing with acid dyestuffs:

The polyamide material is treated in the bath containing 2-3 % liposome LP-16 for the period of 30 min. The starting temperature of bath is about 30 °C for dyeing pale shades and up to 50 °C for deep shades, respectively. After the addition of the well-dissolved dyestuff, the bath is brought to a simmer within 45 min, and the dyeing

process is continued for another 60 min. The resulting shade is even and deep in contrast to that obtained with a non-encapsulated preparation.

Example 17

Liposome of sodium chloride, lecithin membrane, addition of cholesterol (LP-17)

Sodium chloride p.a. (100 g) is dissolved in 200 cm^3 distilled water. Then a solution is prepared from 3.75 g soya lecithin (Ekoprodukt Ltd., Jinačovice, the Czech Republic) and 200 cm^3 water. A fine emulsion is formed after vigorous stirring, which is continued while adding 1.25 g cholesterol (Sigma-Aldrich Co.). The system is converted to emulsion after 1 hour at room temperature followed by another 15 min in ultrasonic bath. The obtained emulsion is added to the above-mentioned solution of sodium chloride, and the resulting mixture is first stirred for 1 hour and then dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.4 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 150-155 °C, at the bottom outlet 75-78 °C, flow rate at the jet inlet 3.5 $g.min^{-1}$. The yield is 105 g liposome of sodium chloride LP-17, which exhibits the ZETA potentials of –55.9 mV (ZETA deviation 11.3 mV) and –11.5 mV (ZETA deviation 7.9 mV) in water.

Examples of application:

Auxiliary preparation for the fixation of textiles dyed with anionic dyes, auxiliary preparation for the addition to detergents (washing preparations – mixtures of tensides and auxiliary substances) preventing the migration of dyes during washing of dyed textiles, auxiliary preparation for the addition to residual baths after dyeing with anionic dyes, which facilitates the removal of residual dyestuff from dye bath. Auxiliary preparation for the addition to dye baths during dyeing of anionically modified poly (acrylonitrile) with cationic dyes. Auxiliary preparation that increases exploitation of anionic dyes in dyeing of cellulose materials. Auxiliary preparation for the addition to dye baths for dyeing natural and synthetic polyamides with anionic and cationic dyes.

Example of wool dyeing with 1:1 metal-complex dyestuffs:

The material to be dyed is treated at the temperature of 40-50 °C in the bath containing 10-20 % (calculated on the weight of the material) liposome of sodium

chloride LP-17, and 8-11 % sulphuric acid (96 %, i.e. 66° Bé), pH 1.9-2.2. After 10 min, the well-dissolved dyestuff is added, and the material is dyed at the temperature of 40-50 °C for the period of 90 min, after that the bath is heated to the boil within 30-45 min, and the dyeing process is continued for 90 min. Finally, the material is thoroughly rinsed with water. The last rinsing bath contains 1-2 cm^3 ammonia. The resulting shade is more even and deeper than that obtained with the use of non-encapsulated salt.

Example 18

Liposome of carboxymethyl cellulose, lecithin membrane (LP-18)

Carboxymethyl cellulose (100 g) (Blanose 7L, the viscosity of 2% aqueous solution is 40 mPa; product of Comp. HERCULES – Aqualon) is dissolved in 3300 cm^3 distilled water with vigorous stirring. Separately, 5 g lecithin (Ekoprodukt Ltd., Jinačovice, the Czech Republic) is mixed with 300 cm^3 water. Both solutions are admixed with vigorous stirring, which is continued for 1 hour. Then the mixture is dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.4 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 150-155 °C, at the bottom outlet 75-78 °C, flow rate at the jet inlet 3.5 $g.min^{-1}$. The yield is 105 g liposome of carboxymethyl cellulose LP-18, which exhibits the ZETA potential of – 71.5 mV in water (ZETA deviation 6.2 mV).

Examples of application:

Auxiliary preparation for the addition to dye baths for dyeing of polyamides and polyesters with disperse dyes by high-temperature process as well as the process assisted by carriers.

Example of high-temperature dyeing of polyester with disperse dyes:

The bath containing 1 $g.dm^{-3}$ liposome LP-18, 2 $g.dm^{-3}$ ammonium sulphate, and formic acid to adjust pH to 5-5.5 is kept at the temperature of 50-60 °C. After 10 min, the well-dispersed disperse dye is added and the temperature is raised to 125-130 °C within 30 min. The material is dyed for the period of 60 min. The resulting shade is more even and deeper than that obtained with the use of non-encapsulated dispersant – carboxymethyl cellulose.

Example 19

Liposome of sodium chloride, lecithin membrane (LP-19)

Sodium chloride p.a. (180 g) is dissolved in 600 cm^3 distilled water. Separately, a homogeneous milky solution (fine dispersion) is prepared from 20 g lecithin (soya lecithin, Ekoprodukt Ltd., Jinačovice, the Czech Republic) and 200 cm^3 water. After being well stirred, both the solutions are admixed, the mixture is stirred for 1 hour and then dried in the spray drier Büchi 190 (input 2900 W) equipped with a 1.3 mm jet, where the drying conditions are as follows: the temperature at the top of the drier 165-170 °C, at the bottom outlet 104-107 °C, flow rate at the jet inlet 5 $g.min^{-1}$. The yield is 200 g liposome of sodium chloride LP-19, which exhibits the ZETA potential of – 29.1 mV in water (ZETA deviation 5.9 mV).

Examples of application:

Auxiliary preparation for the addition to dye baths for dyeing cellulose fibres with direct dyes, reactive dyes, vat dyes, sulphur dyes. Auxiliary preparation for the addition to dye baths for dyeing wool and synthetic polyamides with acid dyes, metal-complex dyes 1:1 and 1:2 of all classes and reactive dyes. Auxiliary preparation for the addition to dye baths for dyeing polyamide prone to streaking. Auxiliary preparation for the addition to dye baths for dyeing of anionically modified poly(acrylonitrile) with cationic dyes.

Example of dyeing of tippy wool with slightly acid dyestuff:

The following ingredients are added at the temperature of 40 °C: 2-4 % ammonium sulphate, 5-10 % encapsulated electrolyte LP-19. The textile material is treated in the bath for 5 min, after that the slightly acid dye for wool is added, the material is treated in the bath for another 5 min, and then the temperature is raised to 100 °C within 20-45 min. The dyeing process continues at this temperature for the period of 60 min. The tippy appearance of wool is improved in contrast to the dyeing results using non-encapsulated salt, when the tippy appearance of wool is not improved.

CLAIMS:

1. A liposome of textile auxiliary agent, characterized in that it consists of a solid nucleus containing a textile auxiliary agent and a membrane containing a phospholipid and optionally cholesterol, a surfactant and/or a water-soluble polymer of cationic type, wherein the content of the textile auxiliary agent referenced to the total weight of the liposome is 80-99.5 % wt., the content of the phospholipid is 0.5-20 % wt., the content of cholesterol is up to 19.5 % wt., the content of the surfactant is up to 19.5 % wt., the content of the water-soluble polymer of cationic type is up to 19.5 % wt, whereas the liposome is a solid particle.

2. The liposome of textile auxiliary agent according to claim 1, characterized in that the textile auxiliary agent is selected from the group comprising salts and dispersants.

3. The liposome of textile auxiliary agent according to claim 1 or 2, characterized in that the content of the phospholipid is 0.5-10 % wt.

4. The liposome of textile auxiliary agent according to any of claims 1-3, characterized in that the phospholipid is lecithin.

5. The liposome of textile auxiliary agent according to claim 4, characterized in that the lecithin is selected from the group comprising rapeseed, egg, soya lecithin, and dipalmitoylphosphatidylcholine.

6. The liposome of textile auxiliary agent according to claim 4 or 5, characterized in that the lecithin is hydrogenated.

7. The liposome of textile auxiliary agent according to any of claims 2-6, characterized in that the salt is selected from the group comprising sodium chloride NaCl, ammonium sulphate $(NH_4)_2SO_4$, sodium sulphate Na_2SO_4, ammonium chloride NH_4Cl, sodium citrate $Na_3C_6H_5O_7$, sodium carbonate Na_2CO_3, sodium hydrogencarbonate $NaHCO_3$, sodium dihydrogenphosphate NaH_2PO_4, sodium hydrogenphosphate Na_2HPO_4, sodium phosphate Na_3PO_4, and their hydrates.

8. The liposome of textile auxiliary agent according to any of claims 2-6, characterized in that the dispersant is selected from the group comprising sodium salt of naphthalenesulphonic acid, sodium lignin-sulphonate, carboxymethyl cellulose, sodium salt of carboxymethyl cellulose, hydroxyethyl cellulose, carboxymethyl starch, sodium salt of carboxymethyl starch, hydroxyethyl starch, oxidised starch, sodium salt of poly(acrylic acid), sodium salt of hydrolysed poly(maleic anhydride), sodium salt of co-polymer of acrylic acid and hydrolysed maleic anhydride, amidated and imidated poly(maleic anhydride), its co-polymers and quaternised derivatives, poly(vinyl alcohol) and its co-polymers with maleic anhydride and/or acrylic acid.

9. The liposome of textile auxiliary agent according to claim 8, characterized in that the dispersant is selected from the group comprising sodium salt of naphthalenesulphonic acid and sodium salt of carboxymethyl cellulose.

10. The liposome of textile auxiliary agent according to any of claims 1-8, characterized in that the surfactant is selected from the group comprising anionic, cationic, amphoteric or non-ionic surfactants.

11. The liposome of textile auxiliary agent according to claim 10, characterized in that the anionic surfactants are selected from the group comprising particularly salts of fatty acids, sulphated fatty alcohols, sulphated oxyethylated fatty alcohols, sulphated enthanolamides of fatty acids, alkylarylsulphonates, esters of phosphoric acid and fatty alcohols or their ethoxylated derivatives.

12. The liposome of textile auxiliary agent according to claim 10, characterized in that the cationic surfactants are selected from the group comprising particularly quaternary ammonium or pyridinium compounds.

13. The liposome of textile auxiliary agent according to claim 10, characterized in that the amphoteric surfactants are selected from the group comprising particularly compounds of the betaine type.

14. The liposome of textile auxiliary agent according to claim 10, characterized in that the non-ionic surfactants are selected from the group comprising particularly oxyethylenated fatty alcohols, oxyethylenated fatty acids,

oxyethylenated alkylphenols, oxyethylenated fatty amines, alkanolamides of fatty acids or their oxyethylenated derivatives, oxyethylenated methyl esters of fatty acids, block co-polymers of oxirane and methyloxirane, and also non-ionic compounds in which the polar part of the molecule is formed by mono- to oligosaccharides.

15. The liposome of textile auxiliary agent according to claim 10, characterized in that the surfactant is selected from the group comprising oxyethylenated fatty alcohol, oxyethylenated alkylphenol, oxyethylenated quaternised fatty amine, quaternary ammonium compound, and a quaternary ammonium compound of the esterquat type.

16. The liposome of textile auxiliary agent according to any of claims 1 to 15, characterized in that the water-soluble polymer of cationic type is selected from the group comprising water-soluble polymeric compounds with amino group, water-soluble polymeric compounds with amide group, and water-soluble polymeric compounds containing secondary, tertiary or quaternary nitrogen atom.

17. The liposome of textile auxiliary agent according to claim 16, characterized in that the water-soluble polymer of cationic type is selected from the group comprising poly(vinylpyrrolidone) and poly(dimethyldiallylammonium bromide).

18. A method of preparation of the liposomes of textile auxiliary agent according to any of claims 1 to 17, characterized in that in 100 mass units of water, preferably distilled or deionized, 2-40 mass units of the textile auxiliary agent is dissolved, then the phospholipid or its solution or dispersion is added with stirring to the solution of the compound to be encapsulated, after that the milky dispersion formed is dried in a spray drier, where the temperature at the top of the spray drier is in the range of 140-170 °C and the temperature at the bottom of the spray drier is in the range of 70-110 °C.

19. The method according to claim 18, characterized in that the phospholipid, before its addition to the solution of the compound to be encapsulated, is mixed with a compound selected from the group comprising surfactants, cholesterol, water-

soluble polymer of cationic type or their mixture, and the resulting mixture is homogenised.

20. A preparation based on liposomes, in particular for the addition to dye baths, characterized in that it contains the liposomes of textile auxiliary agent according to any of the claims 1 to 17, whereas the preparation is in the form of powder.

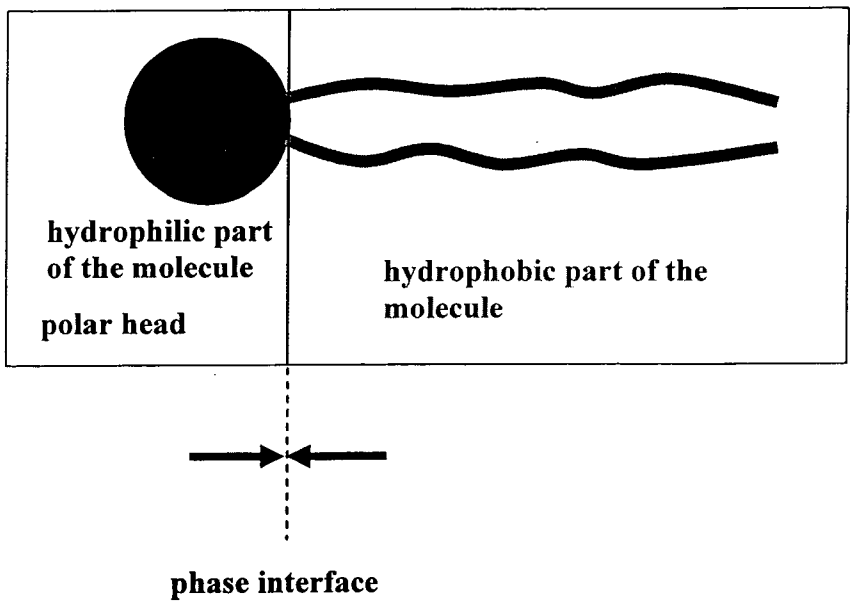
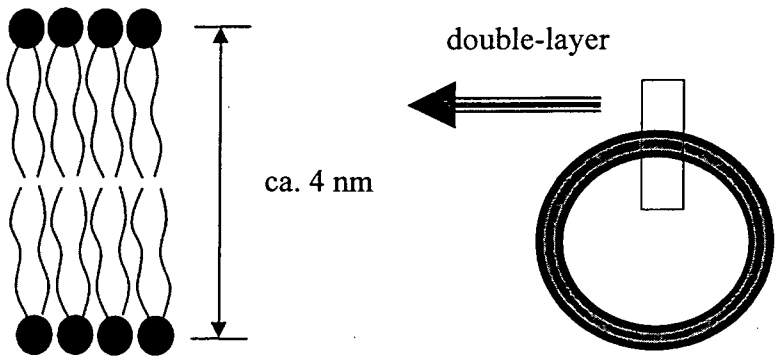

hydrophilic part of the molecule
polar head
hydrophobic part of the molecule
phase interface

Fig. 1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double-layer

Fig. 2

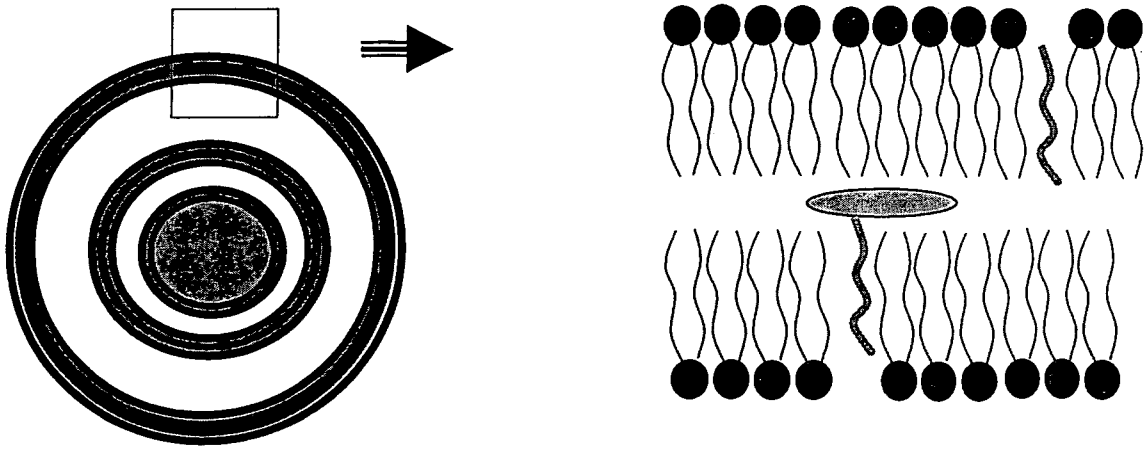


Fig. 3

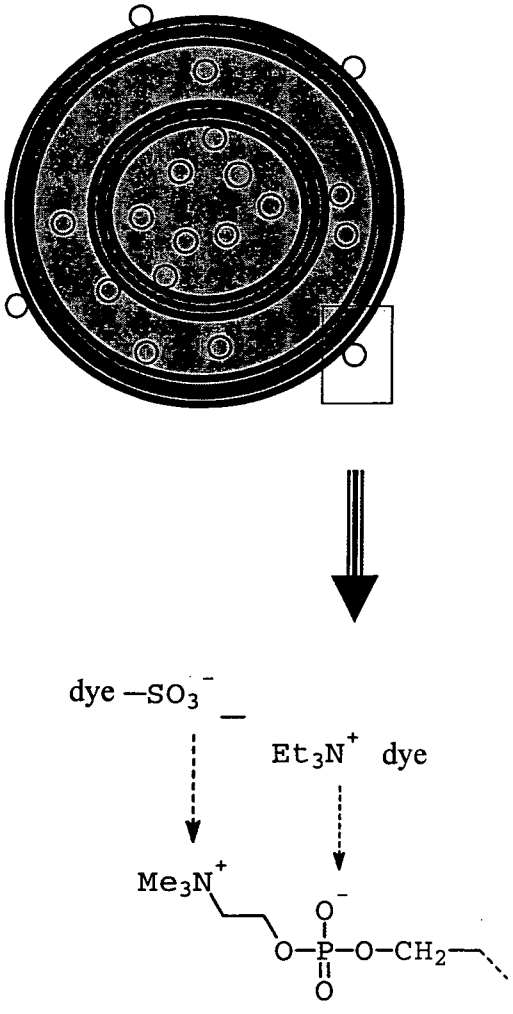
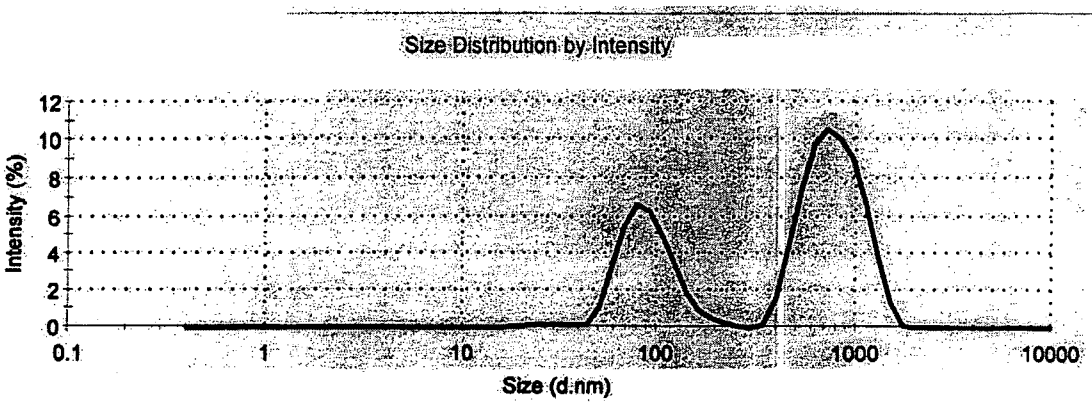


Fig. 4


Size Distribution by Intensity
Intensity (%)
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10
8
6
4
2
0
0.1
1
10
100
1000
10000
Size (d.nm)

Fig. 5

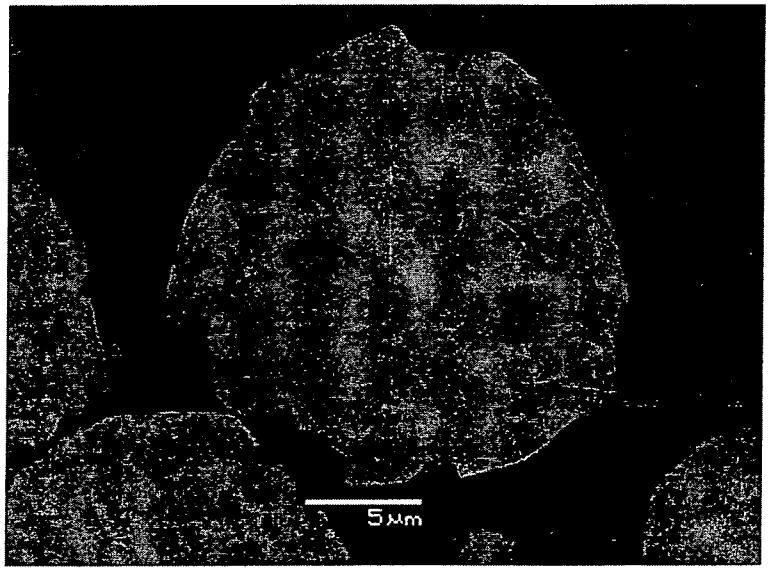
5 µm

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/CZ2008/000003

A. CLASSIFICATION OF SUBJECT MATTER
INV. D06M11/13 D06M13/292 D06M15/11 D06P1/655 D06P1/667
D06P1/673 A61K9/127 C07F9/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D06M D06P A61K C07F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 510 619 A (COGNIS DEUTSCHLAND GMBH [DE] COGNIS IP MAN GMBH [DE]) 2 March 2005 (2005-03-02) the whole document	1-20
A	DE 195 22 693 A1 (DIANORM G MAIERHOFER GMBH [DE]) 2 January 1997 (1997-01-02) page 4, line 17 - line 31; examples 1,2	1-7
A	"Composition for preparing viscose-polyester textiles for dyeing and printing" DERWENT,, 1 January 1900 (1900-01-01), XP002353139 abstract	1,18,20

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 May 2008	05/06/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Koegler-Hoffmann, S

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/CZ2008/000003

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1510619 A	02-03-2005	DE 10339358 A1	24-03-2005
		US 2005058700 A1	17-03-2005
DE 19522693 A1	02-01-1997	WO 9700671 A2	09-01-1997