Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).
The detergent composition may be a laundry (fabric cleaning/treatment) detergent composition or a dishwashing machine detergent composition and thus is suitable for use in (fabric) washing and dishwashing machines (automatic or manual).

The capsule may contain any form of detergent: liquid, powder, gel, paste or the like or combinations thereof. Preferably, the relative inclination of first and second end seals is between approximately 30 and 90 degrees. Particular preferably the inclination of each wall is between 30-90 degrees. Preferably the inclination of each wall is between approximately 30 - 60 degrees.

In a preferred embodiment the capsule is in the form of a tetrahedron (four-walled polyhedron). The tetrahedron may be regular or irregular i.e. the walls may take the shape of regular or irregular polygons. The tetrahedron shape is advantageous in that it can be a fairly simple structure to manufacture (as compared with other polyhedrons with more walls) and at the same time the inclination of each wall relative to each other is such that this facilitates crumpling of the walls and entrapment of wash liquor which aids dissolution. Accordingly, in one aspect, the invention provides a water-soluble capsule according to claim 1.

With the invention, the capsule may be formed into a polyhedron by adapting existing vertical form fill and seal machinery, thereby reducing the costs of producing capsules according to the invention.

Preferably, the relative inclination of first and second end seals is between approximately 30 and 90 degrees. In a preferred embodiment, the first and second end seals are orientated orthogonal relative to each other. This provides a tetrahedron shaped capsule.

The transition between adjacent walls may be slightly curved (e.g. due to the force exerted by the contents of the capsule, and the flexibility of the capsule material) whilst at the same time, distinct walls can still be seen and are still distinguishable from one another.

The walls may be substantially flat however, it this is not essential, indeed the or each wall may have a slight curvature (e.g. due to the force exerted by the contents of the capsule, and the flexibility of the capsule material) so long as the overall shape is still apparent and the general plane of each wall is inclined to the general plane of each of the other walls. However, a problem encountered with some known water-soluble capsules, such as square or rectangular shaped capsules in the shape of pillow (e.g. as shown in figures 3a and 3b of the drawings herein), is that when in the wash liquor, the capsule film will often dissolve partially releasing its contents and then collapse under pressure of the surrounding wash liquor, so that adjacent walls may be forced to lie substantially flat against each other and become partly or wholly co-joined in that position. In extreme cases two walls may become completely contiguous so that they act as one wall of double thickness. The resulting portion or wall is, as a consequence of its increased thickness, less soluble.

There is also the problem that, due to this tendency, in some cases capsule film may remain undissolved, presenting an unsightly mess to the user when they remove the washing from the machine.

Preferably the relative inclination of first and second end seals is between approximately 30 and 90 degrees. Particular preferably the inclination of each wall is between 30-90 degrees. Preferably the inclination of each wall is between approximately 30 - 60 degrees.

Accordingly, in one aspect, the invention provides a water-soluble capsule according to claim 1. With the invention, the capsule may be formed into a polyhedron by adapting existing vertical form fill and seal machinery, thereby reducing the costs of producing capsules according to the invention.

Preferably, the relative inclination of first and second end seals is between approximately 30 and 90 degrees. In a preferred embodiment, the first and second end seals are orientated orthogonal relative to each other. This provides a tetrahedron shaped capsule.

The transition between adjacent walls may be slightly curved (e.g. due to the force exerted by the contents of the capsule, and the flexibility of the capsule material) whilst at the same time, distinct walls can still be seen and are still distinguishable from one another.

The walls may be substantially flat however, it this is not essential, indeed the or each wall may have a slight curvature (e.g. due to the force exerted by the contents of the capsule, and the flexibility of the capsule material) so long as the overall shape is still apparent and the general plane of each wall is inclined to the general plane of each of the other walls. However, a problem encountered with some known water-soluble capsules, such as square or rectangular shaped capsules in the shape of pillow (e.g. as shown in figures 3a and 3b of the drawings herein), is that when in the wash liquor, the capsule film will often dissolve partially releasing its contents and then collapse under pressure of the surrounding wash liquor, so that adjacent walls may be forced to lie substantially flat against each other and become partly or wholly co-joined in that position. In extreme cases two walls may become completely contiguous so that they act as one wall of double thickness. The resulting portion or wall is, as a consequence of its increased thickness, less soluble.
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Throughout the Figures common numbers are used to designate similar features.

[0019] Figure 1 is a perspective view of a capsule according to a form of the invention;

[0020] Figure 2 is a side view of the capsule of Figure 1;

[0021] Figures 3a and 3b are front and side views of a known pillow shaped capsule containing a liquid detergent (outside the scope of the invention);

[0022] Figure 4 is a view of a capsule according to another form of the invention;

[0023] Figure 5 is a view of a capsule according to another form of the invention; and

[0024] Figure 6 is a view of a capsule according to another form of the invention.

[0025] The capsule is in the form of a four-walled polyhedron, i.e. a tetrahedron, each wall (only two shown: 10,12) of the polyhedron being inclined at an angle of relative to each other wall (10,12).

[0026] The capsule is formed from a flexible film disposed in folded configuration and sealed with one longitudinal seal 4a and first and second end seals 6,8 located at opposed ends of the capsule 1. The first seal 6 is substantially orthogonal to the longitudinal seal 4a and further it is substantially orthogonal to the second end seal 8.

[0027] The sealing device for forming the transverse seals is commonly an impulse sealer, wherein an electrical current flows through the sealing element for only a fraction of the sealing cycle. After the current has heated the sealing element and melted the thermoplastic film, there is then a cooling period, during which the seal resolidifies.

[0028] There are many variants on the ways such machines operate. A typical vertical form, fill and seal machine is sold under the trade name GV2K1 by Gainsborough Engineering Company.

[0029] As can be seen from the drawings 1 and 2, some of the edges 24,22 of the tetrahedron are sharply defined by seals - However some of the edges 20,26,28 have no seal so that the transition between adjacent walls e.g. walls 10 and 12 is slightly curved (due to the pressure of the contents contained in the capsule) whilst at the same time, two distinct walls 10, 12 can still be seen extending from such an edge 20 and the overall shape of a tetrahedron is apparent. Furthermore, in order for the invention to work, it is not essential that each wall of the capsule is entirely flat, indeed the walls may have a slight curvature as shown in the drawings(e.g. due to the force exerted by the contents of the capsule) so long as general plane of each wall is inclined to the general plane of each of the other walls so that the overall tetrahedron shape is still apparent.

[0030] The tetrahedron shapes shown are not perfectly regular tetrahedrons as the walls are not perfectly regular polygons. Regular tetrahedrons can be formed by adjusting the width of the tube (i.e. length of end seal) to equal the length of the tube (length of the longitudinal seal).

[0031] Referring to figure 4, the capsule 1 shown here has end seal 6 oriented orthogonal to the longitudinal seal and inclined at an angle of approximately 80 degrees to the second end seal 8. This produces what may be describes as a slightly skewed tetrahedron, whose walls are asymmetrical. However, the shape still functions to increase the
solubility of the capsule film.

[0032] Referring to figure 5, the capsule shown here is formed with two longitudinal seals 4b and 4c along side edges (26,28) of the capsule during formation. The polyhedron formed has a greater number of distinct edges (22,24,26,28) where the seals (4b,4c,6,8) are located (as compared say with the capsule shown in figs 1 and 2).

[0033] Figures 6 shows another capsule according to the invention. The capsule has five-walls and is configured as a pyramid with 4 walls and a base.

[0034] In one embodiment a capsule according to the invention contains a liquid detergent composition. When a liquid detergent composition is used, it is preferred that the composition is essentially non-aqueous. However, compositions may be used which contain substantial amounts of water, provided that this water is in a form where its chemical activity is reduced (e.g. as water of crystallisation or in combination with a solvent such that its vapour pressure is reduced) such that the soluble film does not dissolve prematurely.

[0035] In another embodiment One example of a detergent composition used is as follows:

<table>
<thead>
<tr>
<th>Raw material</th>
<th>Level (weight percent of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonionic Surfactant (alcohol ethoxylate)</td>
<td>20.00</td>
</tr>
<tr>
<td>Linear Dodecylbenzene Sulphonic Acid</td>
<td>20.00</td>
</tr>
<tr>
<td>Fatty acid</td>
<td>17.00</td>
</tr>
<tr>
<td>Monopropylene glycol</td>
<td>22.35</td>
</tr>
<tr>
<td>Monoethanolamine</td>
<td>9.65</td>
</tr>
<tr>
<td>Water, perfume, minor ingredients</td>
<td>11.00</td>
</tr>
</tbody>
</table>

[0036] In another embodiment, capsules contain a granular laundry detergent powder as follows:

**Base powder**

[0037]

<table>
<thead>
<tr>
<th>Raw material</th>
<th>Level (weight percent of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Dodecylbenzene Sulphonic Acid (Sodium salt)</td>
<td>8.8%</td>
</tr>
<tr>
<td>Alcohol ethoxylate (C12 - C13 7 EO)</td>
<td>7.0%</td>
</tr>
<tr>
<td>C16 -C18 Carboxylic acid</td>
<td>1.0%</td>
</tr>
<tr>
<td>Zeolite</td>
<td>29.6%</td>
</tr>
<tr>
<td>Anhydrous Sodium Carbonate</td>
<td>10.5%</td>
</tr>
<tr>
<td>Moisture, Salts, Minors</td>
<td>4.1%</td>
</tr>
</tbody>
</table>

(All above in a granulated Base Powder)

**Post-dosed ingredients**

[0038]

<table>
<thead>
<tr>
<th>Raw material</th>
<th>Level (weight percent of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Percarbonate</td>
<td>18.0%</td>
</tr>
<tr>
<td>Tetracetyl ethylenediamine</td>
<td>3.5%</td>
</tr>
<tr>
<td>Sodium Disilicate</td>
<td>5.5%</td>
</tr>
<tr>
<td>Sodium Citrate</td>
<td>2.0%</td>
</tr>
<tr>
<td>Fluorescer, antifoam, speckles, enzyme, fragrance, minors</td>
<td>10.0%</td>
</tr>
</tbody>
</table>

[0039] In use capsules according to the invention can conveniently be placed directly into the wash liquor where the film dissolves, releasing the liquid detergent composition.

Dissolution of all the capsule film is aided by the topological constraints imposed by the above arrangement.

If the capsule does start to collapse, (after partial dissolution of the capsule and release of detergent) it is more difficult for walls to become co-joined with complete evacuation of fluid. Even if walls do become attached in places the orientation of the walls relative to each other is such that this facilitates crumpling of the walls and entrapment of wash liquor which
aids dissolution and reduces the possibility of undissolved capsule film persisting throughout the wash.

[0040] It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiments which are described by way of example only.

Claims

1. A water soluble capsule (1) containing a detergent composition (2), the capsule being formed from a flexible film disposed in folded configuration and sealed with c) one or more longitudinal seals (4a, 4b, 4c); and d) first and second end seals (6, 8) located at opposed ends of the capsule (1), characterised in that the first end seal (6) is substantially orthogonal to the or each longitudinal seal (4a, 4b, 4c) and inclined at an angle to the second end seal (8).

2. A water soluble capsule (2) according to claim 1 characterised in that the relative inclination of first and second end seals (6, 8) is between 30 and 90 degrees.

3. A water soluble capsule according to claim 2 characterised in that the first and second end seals (6, 8) are orientated substantially orthogonal relative to each other.

4. A water soluble capsule (1) according to any preceding claim characterised in that one or more of the seals (4b, 4c, 6, 8) are orientated along respective one or more edge portions (22, 24, 26, 28) of the polyhedron (1).

5. A water soluble capsule (1) according to any preceding claim characterised in that the detergent composition (2) is a laundry composition.

6. A water soluble capsule (1) according to any preceding claim characterised in that the detergent composition (2) is in liquid form.

7. A water soluble capsule (1) according to any preceding claim characterised in that the detergent composition (2) is in powder or granular form.

Patentansprüche

1. In Wasser lösliche Kapsel (1), enthaltend eine Waschmittelzusammensetzung (2), wobei die Kapsel aus einer biegserm Folie, angeordnet in gefalteter Konfiguration, und verschlossen mit
   c) einem oder mehreren Längsverschlüssen (4a, 4b, 4c); und
d) ersten und zweiten Endverschlüssen (6, 8), die bei entgegengesetzten Enden der Kapsel (1) angeordnet sind, hergestellt ist,
   dadurch gekennzeichnet, dass der erste Endverschluss (6) im Wesentlichen senkrecht zu dem oder jedem Längsverschluss (4a, 4b, 4c) und mit einem Winkel zu dem zweiten Endverschluss (8) geneigt ist.

2. In Wasser lösliche Kapsel (2) nach Anspruch 1, dadurch gekennzeichnet, dass die relative Neigung der ersten und zweiten Endverschlüsse (6, 8) zwischen 30 und 90 Grad liegt.

3. In Wasser lösliche Kapsel nach Anspruch 2, dadurch gekennzeichnet, dass die ersten und zweiten Endverschlüsse (6, 8) im Wesentlichen senkrecht bezüglich zueinander orientiert sind.

4. In Wasser lösliche Kapsel (1) nach einem vorangehenden Anspruch, dadurch gekennzeichnet, dass einer oder mehrere der Verschlüsse (4b, 4c, 6, 8) entsprechend einem oder mehreren Kantenteilen (22, 24, 26, 28) von dem Polyeder (1) orientiert sind.

5. In Wasser lösliche Kapsel (1) nach einem vorangehenden Anspruch, dadurch gekennzeichnet, dass die Waschmittelzusammensetzung (2) eine Wäschewaschmittelzusammensetzung ist.
6. In Wasser lösliche Kapsel (1) nach einem vorangehenden Anspruch, dadurch gekennzeichnet, dass die Waschmittelzusammensetzung (2) in flüssiger Form vorliegt.

7. In Wasser lösliche Kapsel (1) nach einem vorangehenden Anspruch, dadurch gekennzeichnet, dass die Waschmittelzusammensetzung (2) in Pulverform oder granulärer Form vorliegt.

Revidcations

1. Capsule hydrosoluble (1) contenant une composition de détergent (2), la capsule étant formée à partir d’un film souple disposé en configuration piée et fermé hermétiquement avec
   c) un ou plusieurs joints longitudinaux (4a, 4b, 4c) ; et
d) les premier et deuxième joints d’extrémité (6, 8) situés aux extrémités opposées de la capsule 1,
caractérisée en ce que le premier joint d’extrémité (6) est essentiellement orthogonal par rapport au ou à chaque joint longitudinal (4a, 4b, 4c) et incliné à un angle par rapport au deuxième joint d’extrémité (8).

2. Capsule hydrosoluble (2) selon la revendication 1, caractérisée en ce que l’inclinaison relative des premier et deuxième joints d’extrémité (6, 8) est entre 30 et 90 degrés.

3. Capsule hydrosoluble selon la revendication 2, caractérisée en ce que les premier et deuxième joints d’extrémité (6, 8) sont orientés essentiellement de façon orthogonale l’un par rapport à l’autre.

4. Capsule hydrosoluble (1) selon l’une quelconque des revendications précédentes, caractérisée en ce qu’un ou plusieurs des joints (4b, 4c, 6, 8) sont orientés le long d’une ou plusieurs parties de bord respectives (22, 24, 26, 28) du polyèdre (1).

5. Capsule hydrosoluble (1) selon l’une quelconque des revendications précédentes, caractérisée en ce que la composition de détergent (2) est une composition pour laver le linge.

6. Capsule hydrosoluble (1) selon l’une quelconque des revendications précédentes, caractérisée en ce que la composition de détergent (2) est sous forme liquide.

7. Capsule hydrosoluble (1) selon l’une quelconque des revendications précédentes, caractérisée en ce que la composition de détergent (2) est sous forme pulvérulente ou granulaire.
REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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