Perlite for Cosmetics
Origin of perlite

- Perlite is a hydrated, naturally occurring glass.

- Hydration occurs from the absorption of near-surface water into the glass:
  - perlite contains 2-6% combined water
  - takes a minimum of 1 million years to form

- Glasses are rare:
  - occur in volcanic rock with high SiO₂ content (explosive volcanos)
  - de-vitrification renders perlite unusable after 15-20 millions years
### Ore qualities

- **Age of the deposit**
  - Old perlite: >10 million years
  - Medium-aged perlite: 5 million years
  - Young perlite: 1 million years

- **Hydration**
  - Expanded unmilled perlite (low density and low mechanical resistance)

- **Mechanical resistance**
  - Expanded unmilled perlite (medium density, high mechanical resistance)

- **Expansion reactivity**

### Typical applications

- Expanded milled perlite (filter-aids)
- Expanded unmilled perlite (low density, good-average mechanical resistance)
- Expanded unmilled perlite (medium density, high mechanical resistance)
Perlite process

Patented process to obtain ImerCare™
ImerCare™ perlite properties

**Main properties**
- Ultra high absorbency power (oil and water)
- Pure white colour (no grey, high luminosity)
- No volume changes after liquid absorption
- Maintains dry touch after liquid absorption (non tacky effect)
- No pellets after drying
- Non greasy effect, soft touch
- Medium refractive index (no traces, invisible on skin)
- Good skin tolerance
- Good fragrance carrier
- Matting and gloss control
- Gentle abrasion
- Chemical resistance, inertness
- Neutral pH (6.5 to 7.5)

**Main applications**
- Hair care
- Tooth care
- Make-up
- Body and face scrubs
- Toiletries
## Perlite: absorption power

<table>
<thead>
<tr>
<th></th>
<th>Oil absorption (ml/100g)</th>
<th>Water absorption (ml/100g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ImerCare™ 400D</td>
<td>220</td>
<td>230</td>
</tr>
<tr>
<td>Perlite</td>
<td>45-270</td>
<td>40-250</td>
</tr>
<tr>
<td>Kaolin</td>
<td>40-50</td>
<td>40-60</td>
</tr>
<tr>
<td>Talc</td>
<td>30-50</td>
<td>30-50</td>
</tr>
</tbody>
</table>
Perlite: absorption power

Powders in market

- Silicas
  *Aerosil 200 Evonik Degussa*

- Modified starches: absorption 200%
  *Waterlock superabsorbent C200 grain processing
  Octacare X100 Avecia*

- Crosslinked acrylic polymer:
  *Permasorb 30
  Luquasorb 1303 BASF*

- Micronized waxes (polyethylene)

- Bismuth oxychloride

Technical advantages of perlite versus current powders

- Combines 2 absorbing properties:
  - Oil absorption
    - Non greasy effect
    - Good fragrance capacity tenacity
  - High water absorption
    - 40% to 300%
    - Maintains dry touch after liquid absorption (non tacky effect)
  - No volume changes after liquid absorption
  - Medium refractive index, transparency on skin (no traces)
  - Pure white color (no grey)
  - Good skin tolerance
  - Low apparent density
  - No pellets after drying

Recommended grades:
- ImerCare™ 20P
- ImerCare™ 25P
- ImerCare™ 30P

Mineral origin
**Perlite: matting power**

- **Specular reflexion** + Partial transmission
- **Specular reflexion**
- **Light diffusion**
- **Light diffusion** + Partial light transmission

**GLOSS & SILK EFFECT**
- Mica
- Oxychlorure of bismuth

**ULTRA SHINY EFFECT**
- Borosilicates
- Metallic pigments
- Paillettes

**MATTING EFFECT**
- Perlite
- Diatomite
- Kaolin, Talc...

**SOFT FOCUS EFFECT**
- PMMA
- Nylon
- Silica
- Composites
Matting power: creams for oily skin with long lasting matt effect

- Both perlite and kaolin provide matt effect but:
  - Combination of high oil absorption and particle size of perlite provides:
    - deeper matt effect
    - longer lasting matt effect
  - The right perlite grade provides the best balance between matting effect, long lasting and skin feel

<table>
<thead>
<tr>
<th>Product name</th>
<th>INCI name</th>
<th>%W/W</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emulgade SE PF</td>
<td>Glyceryl Stearate, Ceteareth-20, Cetareth-12, Cetyl alcohol, Cetyl palmitate</td>
<td>5</td>
<td>BASF</td>
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<tr>
<td>Lanette 0</td>
<td>Ceraryl alcohol</td>
<td>1</td>
<td>BASF</td>
</tr>
<tr>
<td>Labrafac CC</td>
<td>Caprylic/Capric Triglycerides</td>
<td>5</td>
<td>Gattefosse</td>
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<tr>
<td>Vegeligh</td>
<td>Coconut alkanes (and) Coco-caprylates/Caprates</td>
<td>5</td>
<td>Grant</td>
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<tr>
<td>Apricot Oil</td>
<td>Prunus armeniaca kernel oil</td>
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<td>Bertin</td>
</tr>
<tr>
<td>Bioxan SF T50</td>
<td>Tocopherol (mixed)</td>
<td>0.1</td>
<td>Masso</td>
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<tr>
<td>Water</td>
<td>Aqua</td>
<td>76.8</td>
<td>Copper</td>
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<tr>
<td>Glycerin</td>
<td>Glycerin</td>
<td>3</td>
<td>Univar</td>
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<tr>
<td>Satxane CX911</td>
<td>Xanthan Gum</td>
<td>0.4</td>
<td></td>
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<tr>
<td>ImerCare 2K or 25P</td>
<td>Kaolin or perlite</td>
<td>2</td>
<td>IMERYS</td>
</tr>
<tr>
<td>Perfume</td>
<td>Parfum</td>
<td>0.6</td>
<td></td>
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<tr>
<td>Preservatives</td>
<td>Preservatives</td>
<td>TBD</td>
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<tr>
<td>Dermofeel PA3</td>
<td></td>
<td>0.1</td>
<td></td>
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<tr>
<td>Bioxan Acetate 1300IU</td>
<td>Tocopherol Acetate</td>
<td>0.1</td>
<td>Masso</td>
</tr>
<tr>
<td>pH adjustor</td>
<td></td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Imercare™ 25P = 2.3
Imercare™ 2K = 14.5
Perlite: matting power

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**Technical advantages of perlite versus current powders:**

- **Oil absorption:**
  - Non greasy effect, non tacky
  - Sebum absorption, sebum control
  - Long lasting matt effect

- **Medium refractive index:** invisible on skin

- **Pure white color:** luminosity

- Good skin tolerance

- Low specific and apparent density

- Mineral origin

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**Powders in market**

- **Nylon powders**
  Orgasol - Arkema

- **Modified starches**

- **PMMA**
  Covabead - Waker

- **Porous silicas**

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**Recommended grades**

- ImerCare™ 20P
- ImerCare™ 25P
- ImerCare™ 30P
Perlite: gentle abrasion power in toothpaste

**Project scope**
- Use of perlite as whitening booster additive
- Dedicated grade development for toothpaste
- Formulation based calcium carbonate
- Clinical testing and evaluation conducted by the **Oral Health Research Institute at Indiana University, USA**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Ingredient</th>
<th>INCI name</th>
<th>Function</th>
<th>Supplier</th>
<th>%</th>
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<tbody>
<tr>
<td>A</td>
<td>Carbopol 974 NF polymer</td>
<td>Carbomer</td>
<td>Blender</td>
<td>Lubrizol</td>
<td>0.70</td>
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<tr>
<td></td>
<td>Deionised water</td>
<td>Aqua</td>
<td>Diluent</td>
<td>-</td>
<td>20.00</td>
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<tr>
<td>B</td>
<td>Xanthan gum oral care grade</td>
<td>Xanthan gum</td>
<td>Blender</td>
<td>Jungbunzlauer</td>
<td>0.69</td>
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<tr>
<td></td>
<td>Glycerin USP</td>
<td>Glycerin</td>
<td>Humectant</td>
<td>-</td>
<td>4.82</td>
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<tr>
<td></td>
<td>C* Sorbitex NC 16200</td>
<td>Sorbitol (70% solution)</td>
<td>Humectant/Sweetener</td>
<td>Cargil</td>
<td>43.00</td>
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<tr>
<td>C</td>
<td>Surfac SMFP pharma</td>
<td>Sodium monofluorophosphate</td>
<td>Anti-caries agent</td>
<td>Surfacem</td>
<td>0.75</td>
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<tr>
<td></td>
<td>Sodium saccharin</td>
<td>Sodium saccharin</td>
<td>Sweetener</td>
<td>-</td>
<td>0.20</td>
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<tr>
<td></td>
<td>Deionised water</td>
<td>Aqua</td>
<td>Diluent</td>
<td>-</td>
<td>15.00</td>
</tr>
<tr>
<td>D</td>
<td>ImerCare™ Per/White 19</td>
<td>Perlite</td>
<td>Abrasive</td>
<td>Imerys</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td>Calcium carbonate</td>
<td>Calcium carbonate</td>
<td>Abrasive</td>
<td>Imerys</td>
<td>12.50</td>
</tr>
<tr>
<td>E</td>
<td>Surfac SLS/BP powder</td>
<td>Sodium laurel sulfate</td>
<td>Surfactant/foaming agent</td>
<td>Surfacem</td>
<td>0.24</td>
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<tr>
<td></td>
<td>Color N Cap Sil Blue 5601</td>
<td>CI 42090 and silica</td>
<td>Cosmetic colourant</td>
<td>-</td>
<td>q.s</td>
</tr>
<tr>
<td></td>
<td>Flavour</td>
<td>-</td>
<td>Flavour</td>
<td>-</td>
<td>q.s</td>
</tr>
</tbody>
</table>
Perlite: gentle abrasion power in toothpaste

- Relative Dentin Abrasion
- Pellicle Cleaning Ratio
- Enamel Polishing Potential

**PerlWhite 19**
A new, perlite-based, gentle abrasive for toothpaste

- Gentle abrasive effect
- Improved polishing
- pH neutral
Perlite: gentle abrasion power in shampoo

1. Development of shampoo formulas including:
   - Formulation
   - Stability tests
   - Sampling
   - Challenge tests

2. Clinical tests including:
   - Safety tests:
     - In vitro ocular and skin irritation

3. In-vivo evaluation of shampoos including:
   - Sensorial tests by 22 adults for 2 weeks

4. Interpretation of results and general report

Gentle exfoliation power of selected perlite boosts dandruff removal
Perlite: gentle abrasion power in shampoo

Anti-dandruff shampoo

Choice of perlite grade

Perlite grade with soft exfoliating properties

Comparison of 2 formulas:
- Shampoo without perlite (placebo)
- Shampoo with perlite

TESTS: stability, microbiological, safety, use
Perlite: gentle abrasion power in shampoo

ImerCare™ 90P-Scrub

- Functionality: soft exfoliation
- Formulation type: classic-based
- Comparison of 2 formulas:
  - Placebo (shampoo without perlite)
  - Shampoo with ImerCare™ 90P-Scrub
- Laboratory process:
  - Blend B in A at room temperature
  - Mix until xanthan gum is dispersed
  - Blend all ingredients of phase C one by one
  - Homogenize D then blend A+B+C into mixture
- Mix in other ingredients one by one.

<table>
<thead>
<tr>
<th>COMMERICAL NAME</th>
<th>CHEMICAL NAME</th>
<th>SUPPLIER</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>WATER</td>
<td></td>
<td></td>
<td>1.7</td>
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<tr>
<td>TEXAPON N50 IS</td>
<td>AQUEOUS PREPARATION OF ALKYLEATHER SULFATE C12-14</td>
<td>BASF</td>
<td>24.00</td>
</tr>
<tr>
<td>PLANTACARE 2000IP</td>
<td>AQUEOUS PREPARATION OF ALKYL POLYGLUCOSIDE</td>
<td>BASF</td>
<td>10.00</td>
</tr>
<tr>
<td>WATER</td>
<td></td>
<td></td>
<td>37.40</td>
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<tr>
<td>CARBOPOL AQUA SF-1</td>
<td>CARBOMER</td>
<td>LUBRIZOL</td>
<td>6.30</td>
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<tr>
<td>Na2PO4</td>
<td></td>
<td></td>
<td>1.90</td>
</tr>
<tr>
<td>LAMESCOTE PO 65</td>
<td>AQUEOUS PREPARATION OF ALKYL POLYGLUCOSIDE, PARTIAL ESTERS OF FATTY ACIDS WITH GLYCEROL, CARBOXYLIC ACID</td>
<td>BASF</td>
<td>0.60</td>
</tr>
<tr>
<td>GEDGARD 221</td>
<td>DEHYDRACETIC ACID, BENZYL ALCOHOL, AQUA</td>
<td>LONZA</td>
<td>0.90</td>
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<tr>
<td>DERMOFEEL PA3</td>
<td>SODIUM PHYTATE</td>
<td>LUCASMeyer</td>
<td>0.10</td>
</tr>
<tr>
<td>DERMOFEEL G10 LW</td>
<td>POLYGLYCERYL 10 LAURATE, AQUA</td>
<td>DR STRAETMANS</td>
<td>1.20</td>
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<tr>
<td>FRAGRANCE</td>
<td></td>
<td></td>
<td>0.60</td>
</tr>
<tr>
<td>DEHYTON AB 30</td>
<td>BETaine</td>
<td>BASF</td>
<td>7.00</td>
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<tr>
<td>SYMBOQUAT</td>
<td>AQUEOUS PREPARATION OF HYDROXYPROPYL OXIDIZED STARCH PG TRIMONIUM CHLORIDE, STARCH HYDROXYPROPYLTRIMONIUM CHLORIDE</td>
<td>DR STRAETMANS</td>
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<tr>
<td>COMPERLAN 100</td>
<td>COCAMIDE MEA</td>
<td>BASF</td>
<td>0.50</td>
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<tr>
<td>SODIUM CHLORIDE</td>
<td></td>
<td></td>
<td>0.50</td>
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<tr>
<td>CITRIC ACID (20% IN WATER)</td>
<td></td>
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<td>1.00</td>
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<tr>
<td>ImerCare 90P-Scrub</td>
<td>Perlite</td>
<td>IMERYL</td>
<td>3.00</td>
</tr>
<tr>
<td>TITANIUM DIOXIDE</td>
<td>Titanium dioxide</td>
<td>KRONOS</td>
<td>0.10</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>100.00</td>
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</tbody>
</table>
Perlite: gentle abrasion power in shampoo

Panel

23 adults with dandruff who use anti-dandruff shampoo:
- 12 women
- 11 men
- 30-50 years old

Test protocol

<table>
<thead>
<tr>
<th>1st shampoo</th>
<th>2nd shampoo</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 days = 3 applications</td>
<td>7 days = 3 applications</td>
</tr>
<tr>
<td>After 1st use</td>
<td>After 7 days’ use</td>
</tr>
<tr>
<td>Online questionnaire 1</td>
<td>Online questionnaire 2</td>
</tr>
<tr>
<td>Online questionnaire 3</td>
<td>Online questionnaire 4</td>
</tr>
<tr>
<td>Reference n° S3 lot 050313 (Placebo)</td>
<td>Reference n° S4 lot 050313</td>
</tr>
</tbody>
</table>

- Shampoos were applied to short or mid-length hair under normal use conditions.
- Testers had to rub their scalp then wait 1 to 2 minutes before rinsing.
Perlite: gentle abrasion power in shampoo

**After first application***
- Better scalp purification
- Significant effect on amount of foam
- More rapid foam formation

**After one week of use***
- 1 comment saying rinse-off less easy
- Hair is cleaner
- More efficient on persistent dandruff
- Better scalp purification
- Better scalp comfort
- Less effect on dandruff which returns in time

*All tests conducted by IDEA clinic company*
Perlite: gentle abrasion power in shampoo

ImerCare™ 90P-Scrub: 100% natural perlite

- Boosts anti-dandruff removal through soft exfoliation power (patent pending)
- Boosts foam production in terms of quantity of foam and foaming speed (patent pending)
- Boosts scalp comfort after several applications including scalp purification
- Does not prevent dandruff from coming back as no chemical action
- EcoCert Certified
- pH neutral and chemically inert
Use selected perlite to offer similar exfoliation performance as PE beads in Scrub applications

1. Development of shower gel formulas:
   - Formulation
   - Stability tests
   - Sampling
   - Challenge tests

2. Clinical tests including:
   - Safety tests:
   - In vitro ocular and skin irritation

3. Shower gel in-vivo evaluation including:
   - Sensorial evaluation by 20 adults for 4 weeks

4. Interpretation of results and general report
Perlite: scrub power

Choice of the grade from among 30 different products based on perlite or other minerals and technologies

Perlite grade with exfoliating properties

Comparison of 2 formulas:
- Shower gel with PE Beads (placebo)
- Shower gel with perlite

TESTS:
- Stability, microbiological, safety, panel testing
- Exfoliation methodology has been developed by Imerys to characterise products under identical conditions
Perlrite: scrub power

How to formulate ImerCare™400P-scrub

- **Reduce amount vs PE beads:**
  Due to density difference, % weight must be reduced by at least half to obtain same exfoliation performance.

- **Minimal formula changes:**
  - A slight increase in thickener / rheology modifier may be needed to maintain the particles in suspension.
  - Use a suitable suspension agent in your formulation, such as acrylates copolymer, xanthan gum.

- **How to use in the process:**
  - ImerCare™ 400P-Scrub should be incorporated at the end of the mixing process, under low shear to avoid breaking the spherical structure.
  - As perlite is a natural volcanic glass, it will not be affected by heat in a mixing process.

---

**TABLE 1:**

<table>
<thead>
<tr>
<th>Commercial Name</th>
<th>INCI Name</th>
<th>%</th>
</tr>
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<tbody>
<tr>
<td>Water</td>
<td>Aqua (Water)</td>
<td>34.95</td>
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<tr>
<td>CARBOPOL AQUA SF-1</td>
<td>Acrylate Copolymer at 30% MA</td>
<td>8</td>
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<tr>
<td>PROTELAN AG 818</td>
<td>Sodium Cocoyl Glutamate at 30% MA</td>
<td>20</td>
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<tr>
<td>NaOH Solution at 10%</td>
<td>Sodium Hydroxide</td>
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<tr>
<td>PLANTACARE 2000 UP</td>
<td>Decyl Glucoside at 50% MA</td>
<td>10</td>
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<tr>
<td>DEHYTON AB30</td>
<td>Coco-Beilaire at 30% de MA</td>
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<tr>
<td>LAMESOFT PO 65</td>
<td>Caprylyl/Capryl Glucoside</td>
<td>0.5</td>
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<td>ORAMIX CG 110</td>
<td>Coco-Glucoside/Glyceryl Olate</td>
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<td>VERVEINE</td>
<td>Perfume</td>
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<td>EUXYL PE9010</td>
<td>Phenoxyethanol/Ethylhexylglycerin (preservative)</td>
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<td>Citric acid</td>
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<td>Aqua (Water)</td>
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<td>Perlite</td>
<td>3</td>
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<td>BLUE 1</td>
<td>CI 42090 (Blue 1)</td>
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<td>Water</td>
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<td>Water</td>
<td>Aqua (Water)</td>
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<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>100</strong></td>
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</tbody>
</table>
**Study objectives**

Compare the acceptability of 4 exfoliating shower gels under usual conditions

**Method**

Monocentric and comparative study:
- D1 to 7: daily use of 2 shower gels, one on each leg
- D8: visit center to complete 2 questionnaires (one per gel)
- D8 to 28: wash out period
- D28 to 35: daily use of the 2 other shower gels, one on each leg
- D35: visit center to complete 2 questionnaires (one per gel)
- D36: visit center for comparative evaluation of the 4 products (questionnaire)

**Population**

- 20 volunteers
- Women
- Aged 18 to 70
- Dry skin on legs
- No skin lesions, no allergies
- No healing treatment
- Users of exfoliating shower gels

**Assessment criteria**

Analysis of volunteers’ sensations relating to questionnaire answers and comparison of results of 4 exfoliating shower gels
**Perlite: scrub power**

**Results**

<table>
<thead>
<tr>
<th>% of women who would buy the different gels</th>
<th>PE Beads</th>
<th>ImerCare™ 400P-Scrub</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>76</td>
<td>81</td>
</tr>
</tbody>
</table>

**Comments**

- Good exfoliation with no skin irritation
- Soft skin after application
- Good texture, easy to apply and rinse

- Excellent exfoliation with no skin irritation
- Soft skin after application
- Good texture, easy to apply and rinse
- Quantity and texture of foam
- 86% said performance was better than with PE beads.

**Recommended use**

- PE Beads: 3 to 5% weight
- ImerCare™ 400P-Scrub: For equivalent particle size range, use at 50% vs PE beads due to density difference

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ImerCare™ 400P-Scrub can be used as a direct drop for PE beads with better exfoliation performance or in a lower concentration for similar efficacy

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All tests conducted by IDEA clinic company
Perlite: scrub power, desquamation results

In tests, the shower gel containing ImerCare™ 400P-Scrub demonstrated better exfoliation efficiency than the one containing PE Beads formulated at constant weight 3%.

All tests conducted by IDEA clinic company.
Perlite: scrub power

P-SCRUB
A new, perlite-based, gentle abrasive for scrub applications

- Gentle exfoliation
- Ecological alternative to PE beads
- Enhanced scalp comfort

3 available grades:
- ImerCare™ 190P-Scrub (50-250 microns)
- ImerCare™ 270P-Scrub (100-300 microns)
- ImerCare™ 400P-Scrub (100-500 microns)
ImerCare™ perlite range

- **Expanded milled perlite technology**
  - ImerCare™ 20P
  - ImerCare™ 25P
  - ImerCare™ 30P
  - ImerCare™ 90P-Scrub
  - ImerCare™ 120P-Scrub
  - ImerCare™ PerlWhite 19

- **Expanded unmilled technology**
  - ImerCare™ 190P-Scrub
  - ImerCare™ 270P-Scrub
  - ImerCare™ 400P-Scrub
  - ImerCare™ 800P-Scrub
Imerys perlite range

ImerCare™ 20P, 25P & 30P

**ABSORPTION & MATTING**
Particle size distribution
D50 from 20µm to 30µm

**SKIN CARE**
Sebum control (acne cream)
Matting effect (face cream)
Reduced tacking (suncream)

**MAKE UP**
Transparent matt (no coverage)
Long lasting (sebum/sweat)

**TOOTH CARE**
Gentle abrasion

ImerCare™ 90P, 120P & 190P-Scrub

**SOFT EXFOLIATION**
Particle size distribution
D90 from 90µm to 120µm

**HAIR CARE**
Anti dandruff shampoo

**SKIN CARE**
Soft facial exfoliation

ImerCare™ 270P & 400P-Scrub

**EXFOLIATION**
Particle size distribution
D90 from 270µm to 400µm

**BODY HYGIENE**
Exfoliating shower gels
and polyethylene substitution

ImerCare™ 800P-Scrub

**EXFOLIATION**
Particle size distribution
D90 at 800µm

**BODY HYGIENE**
Bar soap
Strong exfoliation