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**Purpose**

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**Materials**

UV-Filters (INCI names):

1. Benzophenone-3 (5)
2. Butyl Methoxydibenzoylmethane (5)
3. 3,3,5-Trimethylcyclhexyl Salicylate (L)
4. Ethylhexyl Salicylate (L)
5. Octyl Methoxycinnamate (L)
6. Octocrylene (L) *(L):Solid (L):Liquid

Emollients (INCI names):

1. Isododecane
2. Cyclomethicone
3. Olea Europaea (Olive) Fruit Oil
4. C12-15 Alkyl Benzoate
5. Shea Butter Ethyl Esters
6. Mineral Oil
7. Caprylic/Capric Triglyceride
8. Ethylhexyl Methoxycrylylene
9. Diethylhexyl 2,6-Naphthalate
10. Ricinus Communis (Castor) Oil
11. Triis(PG-3 Benzyl Ether) Citrate
12. Propanediol Dicaprylate/ Caprate
13. PPG-3 Benzyl Ether Therybenzone
14. Helianthus Annuus (Sunflower) Seed Oil

**Methods**

- 1 gram of UV filter was mixed with 9 grams of emollient, measured on an analytical balance with a readability of 0.001 grams
- Liquid UV filter-emollient mixtures were placed on a magnetic stir plate for ten minutes at 650 rpm. Solid UV filter-emollient mixtures were placed on a magnetic stir plate until all solid dissolved, or thirty minutes at 650 rpm
- Solubility was visually determined after ten/thirty minutes
- SPF testing was done in *vitro* with UV-2000S using PMMA plates (Labsphere, North Sutton, NH), following the FDA 2011 Method guidelines

**Results**

<table>
<thead>
<tr>
<th>SPF</th>
<th>UV Filter</th>
<th>Emollient</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>NS</td>
<td>4</td>
</tr>
<tr>
<td>3.0</td>
<td>11.1</td>
<td>17</td>
</tr>
<tr>
<td>25.0</td>
<td>13.4</td>
<td>23</td>
</tr>
</tbody>
</table>

**Conclusion**

- The SPF of organic sunscreens can be enhanced through the use of emollients
- Basing emollient selection on the chemical structure can result in higher SPF values
- Some emollients, e.g., ethylhexyl methoxycrylylene possess UV absorbing qualities due to their structure
- There are many components that go into determining the effect of an emollient on the SPF of organic sunscreens

**References**

1. CFR Title 21 §201.327 Over-the-counter sunscreen drug products; required labeling based on effectiveness testing.

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