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Spider Effect

One of the first concepts that we learn in chemistry is polarity, specifically the expression "likes dissolve likes". If you put oil and water in the same beaker and stop mixing, they will separate into two phases very quickly. One approach to keep oil and water in one phase is to make emulsions. To achieve this chemists have developed surfactants, which posses both water-soluble and oil-soluble portions in the same molecule.

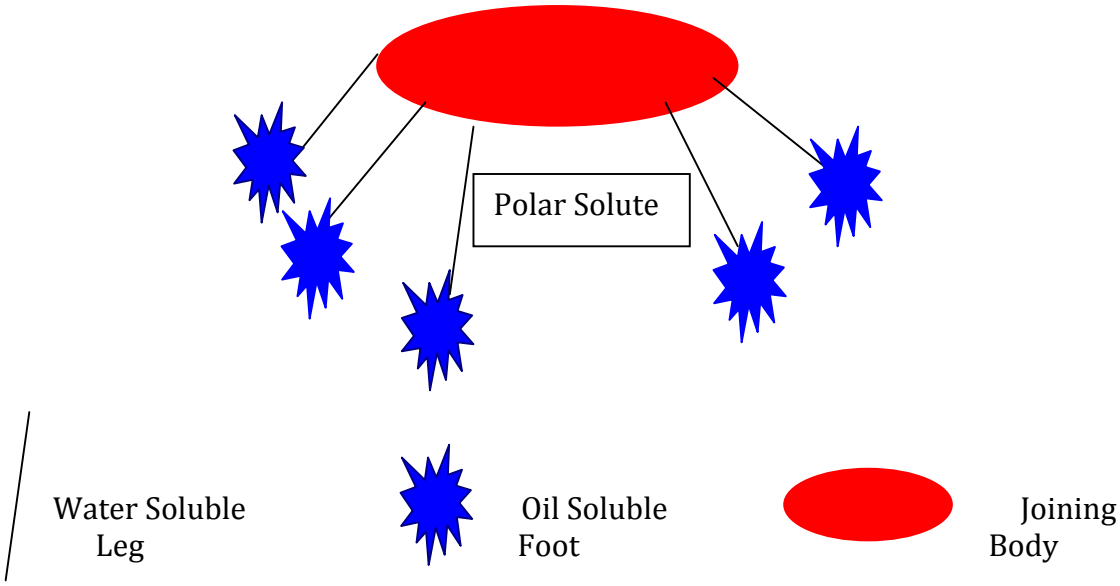
Many surfactants are "soluble" in water, meaning they produce clear "solutions". However, a surfactant's concentration in solution is not uniform throughout. It is highest at the interfaces and in micelles, for exactly the same reason water and oil separates (lowest free energy state). Surfactants rotate or twist at the surface assuming the conformation that results in the lowest free energy. Surfactants provide surface tension reduction, emulsification, wetting and detergency.

Now imagine a molecule where the structure, makes it impossible to rotate or twist. Such a molecule would not be a surfactant despite the presence of both water-soluble and oil-soluble portions. Such products do not reduce surface tension, are water insoluble, and have a great affinity for polar phases. In short they are polar oils.

Spider Esters are molecules in which their structure at lowest free energy is a sphere. The sphere is made up of three portions; a polar core holding polar legs and a non-polar fatty cap. This structure allows for entrapment of polar materials in an oil phase. The unique thing about these products is that when they are heated the polar legs expand and allow gaps in the outer non-polar layer of the sphere. Polar actives are attracted inside the sphere to their lowest free energy, which is up against the polar legs and core.

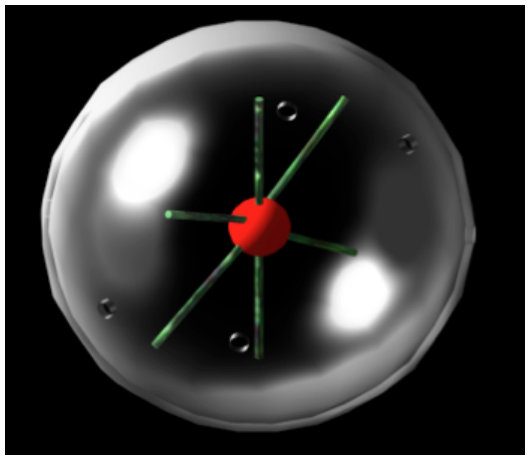
Then by cooling the sphere closes and the polar materials become entrapped.

Spider Graphic



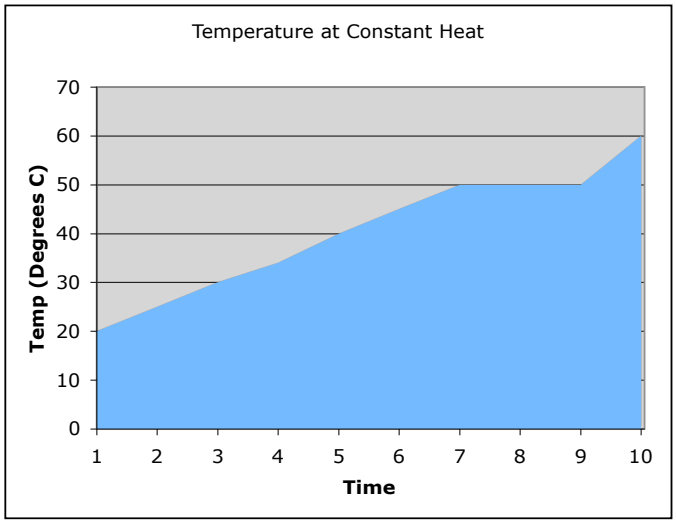
Spider Ester molecules are engineered to have a polar inside (shown in red above), water soluble legs and an oil soluble foot. This makes them unique in their ability to bind molecules into the leg system. This "bonded state" allows for delivery to the hair and skin.

Another representation is shown below. The polar solute is within the clear sphere of the oil soluble foot.



When a solute is added to the Spider Ester™, and the mixture is warmed, the presence of the polyoxyethylene group in the center expands. This opens the Spider Ester to solubilize the solute within the Spider Ester. This is most easily seen when sun-screening agents are added like avobenzone. The avobenzone remains a powder until the Spider Ester opens and the avobenzone is solubilized. It remains solubilized even at low temperatures proving that the effect is not one of solubility product.

If one sets the heating at a constant rate and watches the temperature rise, there will be a flatting out of the temperature rise while the Spider Ester swells and the active is deposited. This is the so-called "Spider Effect".



"Once entrapped in the spider molecule the material contained therein is released based upon partition coefficient. The active establishes an equilibrium with the oils on the skin."

Spider Effect

Once inside the solute is entrapped and loses its odor and irritation properties. Upon changing the polarity of the system (by adding isododecane for example), the Spider Ester swells releasing the solute contained therein.

Oils present on the skin can trigger the release much like the isododecane does.

Spider Esters® solubilize:

- Sun Screens
- Anti oxidants
- Salicylic Acid
- DHA
- Vitamins
- Phytosterols
- Peptides

DISCLAIMER

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