ing, and lubricity. These properties, together with their volatility and mild solvent properties, have made cyclomethicone the highest-volume silicone product used in the cosmetics and toiletries industry. They were first used in the late 1970s as a vehicle for antiperspirant salts in underarm topical products. Since that ime, cyclomethicones have been used in virtually every category of topical product. One reason for the popularity of cyclomethicones as a formulation vehicle is their low heat of vaporization. The heat of vaporization for the cyclomethicone tetramer is only 32 cal/g, which contrasts sharply with that of water (520 cal/g) and ethanol (210 cal/g). This means that topical formulations based on cyclomethicone have a pleasant "dry" feel when they are applied to the skin.

Unlike the dimethicones, cyclomethicones are soluble in a variety of ingredients commonly used in topical products. Table 1 lists the solubility of cyclomethicone in a number of these ingredients. For ingredients that are solids at room temperature, the solubility given in Table 1 is for a mixture that has been heated to approximately 80°C. Solubility of cyclomethicone is generally limited to predominantly nonpolar organic materials, although it is soluble in some polar organic solvents such as ethanol and isopropanol. Because cyclomethicone is more soluble in other ingredients than dimethicone, it is easier to formulate into an existing topical product. This is particularly true for formulations that are solutions. When cyclomethicone functions as the primary formulation vehicle and is the major component in a topical formulation, it is often necessary to employ some special ingredients to accommodate the active ingredients.

C. Phenyltrimethylsiloxane

Phenyl trimethicone is the name that the CTFA (2) has assigned to silicones that conform to the structure shown in Figure 3. Commercially available phenyl trimethicone is a mixture of species corresponding to the structures indicated by Figure 3 for which the value of *n* ranges from one to three. The increased number of organic substituents on the silicon in phenyl trimethicone greatly increases its solubility in organic ingredients relative to dimethyl silicones. Phenyl trimethicone is the only silicone that is miscible in all proportions with 95% ethanol. It is also miscible with all commonly used nonpolar organic ingredients in topical formulations.

Because of its solubility in other ingredients, phenyl trimethicone is easy to incorporate into existing topical formulations. Typically it provides the same benefits as other low-viscosity silicones. Phenyl trimethicone has the additional benefit of a somewhat higher refractive index than dimethyl silicones (1.46 vs. 1.39). Hence, it is used in topical formulations for which gloss is desired, such as in a hair dressing.