

Formulating with Natural and Organic Fragrances^a

Formulator and perfumer insights into cost and performance hurdles

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The explosive growth in natural and organic personal care products during the last few years reflects a changing society and a concern about what people put into their bodies. There isn't a day that goes by where one doesn't see some reference to the word "natural" or "organic," either in the form of an ad, article or consumer study for food and personal care products. **F-1** reflects an average growth rate of 13.2% through 2013 with a US natural/organic personal care (NOPC) market approaching \$18 billion. In light of this growth, this article will explore some of the challenges and hurdles personal care formulators face when creating new organic and natural products requiring NOPC fragrances and the future outlook of fragrances for the NOPC market.

The proliferation of NOPC products entering the marketplace has generated a great deal of consumer concern with respect to product authenticity, product claims and truth in labeling. The explosion in the use, and misuse, of the words "natural" and "organic" in the United States is exacerbated by the fact that there is, for the most part, no regulatory control in the use of the words, so companies have a field day in exaggerating product performance and claims.

For legitimate companies certifying personal care products as organic there is the US Department of Agriculture National Organic Program; for those seeking validation of their natural personal care products in the United States there is the Natural Products Association (NPA) Natural Personal Care Standard. There are a number of companies, particularly in the personal and beauty care industry, that are trying to do the right thing with respect to engineering and marketing truly organic and/or natural personal care products. Unfortunately, their efforts seem to get lost in the day to day false claims and hype in a marketplace in which a recent study showed that of 2,219 products making green claims in North America, only 25 were found to be "sin-free."

That is beginning to change. Nongovernmental organizations are acting as the traffic cops nowadays, doing what the US Food and Drug Administration hasn't—that is, challenging companies to come clean with respect to their greenwashing practices and holding them accountable. The Internet is not very forgiving of greenwashers,

and the last thing a marketer wants is to have its product formulation and/or performance claims openly challenged in a sort of WikiLeaks-style exposure.

Formulator Perspectives

Organic and natural skin care goes beyond the application of products on one's skin. It also pertains to a holistic philosophy surrounding the care of one's body. People who use organic and natural skin care brands are perhaps a bit less concerned with artificial beauty enhancements, as they feel that organic and natural beauty is healthy beauty. But product performance and functionality are still key elements to the brand's success. The allure of organic and natural skin care products is finally taking hold, with many of the popular skin care companies now making the switch for their formulation ingredients. Cognis, for example, has registered and certified almost 100 natural personal care ingredients—including actives, emollients and rheology modifiers—with the NPA in the last 12 months.

With more and more personal care and ingredient manufacturers developing and marketing new and advanced natural and organic skin care ingredients, personal care formulators can now choose from a plethora of affordable ingredients that were not available just a few short years ago. For example, to source a natural fragrance blend just a few years ago would have been cost prohibitive, i.e. \$70–80/lb then vs. \$25–30/lb today. Of course, there are still cost challenges for formulators.

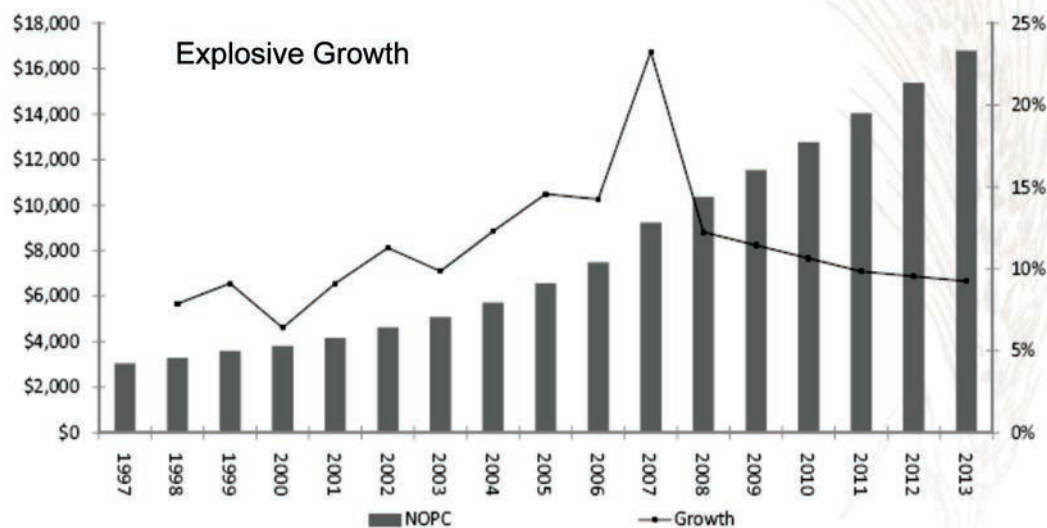
Among personal care formulators and cosmetic chemists, the two major concerns are ingredient performance and price. The performance issue resonates loudest when it comes to natural preservatives, surfactants, solubilizers and fragrances. Gamze Sauzeat, an independent formulator, puts it this way:

"As a natural personal care product formulator, one of the challenges I face on a regular basis is ... solubilizing natural fragrances and essential oils into water-based formulations, such as toners and clear gels. Commonly used solubilizers are not meeting the natural, and certainly not organic, standards. As more and more natural and organic personal care brands understand the importance of having their products certified, the preservative systems and carriers used are becoming critical parameters in choosing raw materials. Launching a brand new anti-aging ingredient with great clinical data, but [with] butylene glycol as the carrier is not the best move at this time."

^aA version of this article was presented as part of Sustainable Fragrances 2011, June 10–11 in Washington, DC; www.sustainablefragrances.com.

Per Kline and Company...
growth rate for NOPC of 13.2% (on average) through 2013

U.S. Natural & Organic Personal Care Sales & Growth: '97-'13



As a frame of reference, I like to quote Shere Rolo, a senior perfumer at Trilogy Fragrances: "My experience and training has always focused on creating fragrances using aroma chemicals. When first faced with creating without products like Galaxolide, Hedione, Cedramber and many other aroma chemicals and working ostensibly with essential oils, I struggled.^b I really had to go back to my roots, to understand the synergies, chemotypes and complementary nature of these essential oils and natural chemicals."

So what exactly is natural? The NPA (www.npainfo.org) describes natural as:

- Green
- Sustainable
- Renewable
- Limited environmental impact/footprint
- Free of petrochemicals/petrochemical-derived ingredients

According to the NPA, natural fragrances are defined as "natural olfactive compounds created from natural extracts,^c natural isolates,^c natural fractions^c or natural exudates^c of flora, or mineral products."

^bGalaxolide is a trademark of IFF; Hedione is a trademark of Firmenich; Cedramber is a trademark of IFF.

^cDerived without the use of petrochemical solvents, i.e. steam (atmospheric or vacuum) distillation, cold process "expression," etc. Ingredients include essential oils and "fractions" of essential oils; carbon dioxide (CO₂) extracts of flora products; vegetable oils and natural chemicals.

Ingredient Challenges

The appeal of natural fragrances vs. single olfactive theme essential oils can best be illustrated in the example of lemon oil. According to essential oil broker Chris Hunt of Cookson, a major crop failure in Argentina in 2008 forced the price of lemon oil to a record high of \$50/kg from a low of \$5/kg a couple of years earlier. As a result, companies looking for consistent quality and price reached out to fragrance manufacturers for citrus-based fragrances.

In the natural and organic world, perfumers' natural and organic ingredient palette consists of:

- Essential oils
- Fractions of essential oils
- Isolates of essential oils/natural chemicals
- Vegetable oils

Some of the concerns surrounding the use of natural fragrances relate to availability of ingredients to support demand, and of course the cost compared to synthetic aroma chemicals—all legitimate concerns. Based on research conducted by this author a couple of years ago, the total value of essential oils was around \$11 billion. In the last few years the industry has seen a significant growth in the use of natural chemicals with a number of new Chinese and Indian manufacturers of natural chemicals emerging. All essential oils have natural chemotype constituents, which can be isolated and used for natural

flavor and fragrance applications. A few that come to mind are 1,8-cineole from rosemary oil, linalyl acetate and linalool present in lavender oil, and β -caryophyllene in ylang-ylang. In fact, most chemicals can be isolated from botanicals, including citral from *Litsea cubeba* and geraniol from palmarosa.

Formulation Challenges

Fragrance is perhaps the single most important consumer-recognized ingredient in soap or cosmetic formulations. The successful incorporation of a fragrance in a consumer product requires aspects of fragrance stability in the product itself, and its deposition, absorption and evaporation from the skin surface after product application.

Fragrance is greatly influenced by the presence of other formula ingredients, including emulsifiers, surfactants, oils, emollients and moisturizers. Many naturally derived fragrances pose problems in soap and cosmetic formulations due to their chemical reactivity, resulting in product discoloration, malodor formation or instability. These formulation challenges require a talented perfumery team that is familiar with understanding how to minimize chemical reactivity in natural and organic personal care applications. It also requires a good working relationship and ongoing dialog and communication with manufacturers of the natural and organic cosmetic formulations. Sharing information helps minimize chemical reactivity issues and stability challenges.

Natural and organic fragrance formulation challenges include:

- Stability/preservatives
- Substantivity
- Price
- Availability
- Hedonics

In recent years there has been a great deal of research and development dedicated to finding 100% natural preservatives that actually work in natural body care products. Historically, alcohol, sugar enzymes and certain essential oils have demonstrated good preservative properties. Natural and organic personal care formulators have looked to antibiotic, antibacterial and bactericide properties of

natural ingredients to effectively kill microorganisms. To aid in preservation, as well as reducing the potential rancidity, natural fragrances today are often stabilized with antioxidants such as natural tocopherol and ascorbic acid.

Substantivity challenges when creating natural fragrances can be frustrating for perfumers, as they have a limited palette of natural ingredients to work with. But they do exist. Essential oils and isolates from essential oils such as vetiver, patchouli, amyris, Peru balsam, galbanum, cassia and vanillin are substantivity building blocks for most natural fragrance perfumers.

Prices and availability for the 300 commercially available essential oils and the more than 1,000 natural chemicals do vary, but no more so than the prices of synthetic chemicals driven by petrochemical or crude sulfate turpentine price fluctuations. Often, they mirror each other. For example, a shortage of synthetic linalool will create demand for natural linalool and vice versa.

Fragrance substantivity and hedonics go hand in hand. There is a great push these days for natural fragrance formulators to create 100% natural versions of their most popular synthetic fragrances. Even “green” consumers want great smelling and complex natural fragrances. As more and more natural isolates and natural chemicals become available and perfumers become more comfortable working with the combination of essential oils and natural isolates, greater variety and complexity of natural fragrances will emerge.

The Future

Finally, it must be said that the future outlook for natural and organic fragrances looks rosy. Those considering entering the game should expect more transparency, regulations, natural and organic chemotypes, olfactive choices, substantivity, and of course price fluctuations based on availability.

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