

Elevance Renewable Sciences Enables Bio-based Paraffins and PAO for Personal Care.

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Abstract. Elevance Renewable Sciences is leveraging proprietary, Nobel Prize-winning olefin metathesis of natural oils to produce a range of specialty chemicals and olefins enabling naturally derived liquid and waxy paraffins, and hydrogenated polydecene (PAO).

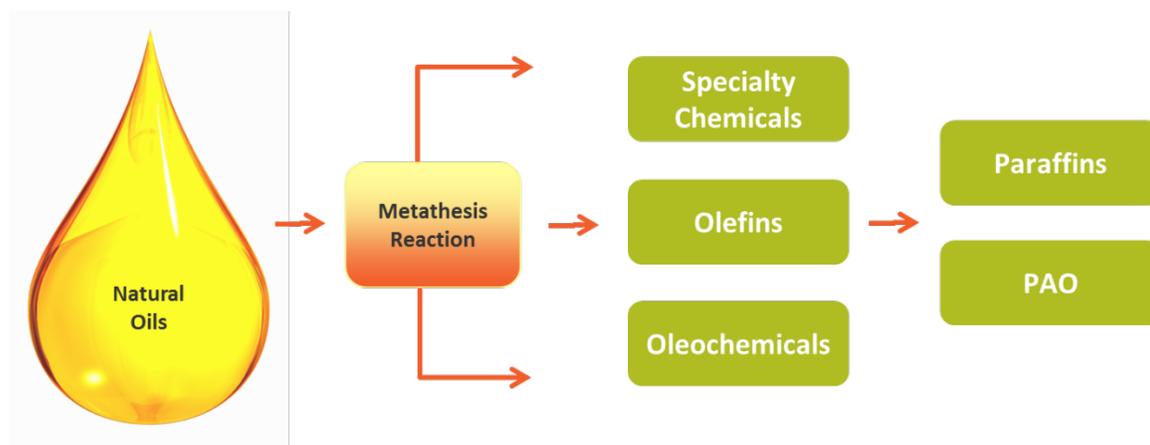


Figure 1. Elevance Renewable Sciences’ energy-efficient, patented biorefinery process affords paraffins and PAO through conventional transformations of its bio-based olefins.

Companies across the specialty chemicals value chain, prompted by evolving consumer sentiment and regulatory requirements, have begun to build sustainability into their product development goals. In an effort to reach these goals, scientists face the conundrum of drawing from an ingredient slate substantially derived from finite resources such as petroleum, natural gas and coal for their design needs. Elevance Renewable Sciences (ERS) has embraced the challenge of providing bio-based alternatives to the industry, in the form of key intermediates and novel, high performance specialty chemicals (Figure 1).

Personal care (PC) is perhaps the most poignant example of an industry striving for sustainable ingredient alternatives. Recent trends have added urgency to such pursuits. Silicones, for example, which are ubiquitously used in PC and cosmetic formulations have recently been the subject of scrutiny on the basis of their biodegradability¹ and energy-intensive means of production. To replace these widely used emollients, the industry has presented paraffins and isoparaffins as effective surrogates for volatile cyclomethicones and more substantive dimethicones.² Indeed, the interchangeability of hydrocarbons and silicones has been demonstrated, dating back to silicone manufacturers’ entry into the personal care market.³ While paraffins and isoparaffins have traditionally performed well versus silicones, the unfavorable trade-off of their chemical origin has limited the growth of PC formulations containing these hydrocarbons.

Elevance Renewable Sciences, through the commercialization of catalytic olefin metathesis of natural oils, has developed naturally derived paraffins and hydrogenated polydecene (PAO) for person-

al care applications from the bio-based olefins its patented process provides.⁴ ERS white oils and waxes represent sustainable options for the formulation of silicone-free personal care products, offering a range of physical properties and conferring a variety of sensory benefits. Importantly, ERS paraffin and isoparaffin emollients offer the performance attributes critical to formulation success while obviating the need to draw upon hydrocarbons obtained from finite sources and silicones manufactured by high energy-consumption production processes.

The opportunity to minimize the usage of silicones applies to a variety of PC and cosmetic products. Formularies dating back to the emergence of silicones in PC demonstrate that silicone usage may vary dramatically in the preparation of a single product type (Table 1). As an example, alternative sunscreen oil formulations show that D4 and D5 implementation can be significantly reduced by the incorporation of volatile liquid paraffins. What is more, silicone-free lipstick formulations may be achieved using waxy and liquid paraffins in combination. ERS’s bio-based liquid paraffins, paraffin wax and PAO are compelling ingredients that factor into the silicone and petrochemical replacement goals of formulation scientists.

Table 1. Example formulations for several personal care product categories leveraging paraffins or silicones.³

	Liquid Paraffin (%) ^{3,5}	Silicone (%) ^{3,6}
Cream foundation:		
Emulsifier	9	2.4
Emollients	7	2.2

Moisturizers	5.7	10
Thickeners	1	0.5
Pigments	11	16.5
Water	40	53.0
Liquid paraffin	20	--
Cyclomethicone	--	15.0
Preservative, fragrance	18	q.s.

Lipstick:	Mineral Oil (%)^{3,7}	Silicone (%)^{3,8}
Pigment grind	20.0	32.4
Waxes	15.0	16.0
Stearoxytrimethylsilane (and) stearyl alcohol	--	4.5
Lanolin oil	5.0	10.0
Avocado oil	--	29.6
Esters	14.0	7.0
Liquid paraffin	40.0	--
Preservative, fragrance	18	q.s.

Moisturizing Sun- screen with water:	Liquid Paraffin (%)³	Silicone (%)^{3,9}
Emulsifier	4.00	10.00
Liquid paraffin	15.00	--
UV absorber	7.50	7.00
Water	61.35	64.97
Humectant	6.00	3.00
Emollient	5.00	5.00
Silicone	--	10.00
Preservative, fragrance	q.s.	q.s.

Clear sunscreen oil:	Mineral Oil (%)^{3,10}	Silicone (%)^{3,11}
Liquid paraffin	68.0	--
Cyclomethicone (D4)	16.0	57.0
Cyclomethicone (D5)	--	16.0
Dimethiconol	--	3.0
Ester	13.0	20.0

UV absorber	3.0	4.0
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For additional information and sample requests, please contact our global market development manager, Michelle Morie-Bebel, at michelle.morie-bebel@elevance.com.

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