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# 100% biobased oil rheology modifier for cosmetics

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## PURPOSE OF THE ABSTRACT

Abstract:
A 100% biobased rheological agent capable of producing transparent gels for polar and non-polar oils has been developed from castor and rapeseed oils as an alternative to fossil fuel-based ingredients in diverse fields such as aerospace, pharmaceutical and cosmetic industries. Thanks to inter-chain hydrogen bonds and three-dimensional networks, EstoGel Green can produce reversible and highly shear-sensitive gels, making it a key ally on the development of a new-generation of responsible products and cosmetics.

Introduction:
Recently, the use of rheology modifiers and thickeners from fossil fuel-based resources has been limited by environmental and economic pressure. With consumers' increasing interest in natural and environmentally friendly compounds, more sustainable alternatives are now essential.

Biobased lipids can be interesting precursor substitutes for traditional monomers. However, sustainable polymers suitable for cosmetic compositions are still scarce and very few examples of biobased oil rheology modifiers that can form transparent gels can be found in the literature.

Herein, castor and rapeseed oils are used on the development of an oil rheology modifier that can form transparent gels with high suspensive ability. The condensation product between a solubilizing block and a gelling block presents a 3D network (Figure 2) capable of producing reversible and highly shear-sensitive gels. The produced poly(ester amide) has features that go beyond its biobased character, pioneer oil gelling effect and versatile highly shear-sensitive structure: it is also non-toxic (skin toxicity, cytotoxicity, ocular toxicity), biodegradable (under post-treatment conditions), odorless, tasteless, easy to process at low temperature (below 85°C), has a pleasant sensorial feeling and is, therefore, in line with the increasing environmental, health and quality concerns.

Methods:
The synthesis of EstoGel Green is divided into two main steps (Figure 1). In the first step, an oligoamide (structural block P2) is synthesized from a diamine and sebacic acid. In the second step, the amino groups of P2 were reacted with an acid group of a solubilizing block (provided by ITERG) to form a poly(ester amide). The molar ratio of each reactant used in both steps was studied. Gelation tests were carried out at different concentrations of EstoGel Green in a variety of oils, by heating (~80°C) and stirring for 30 min. The viscosity of the gels at low stress (0.1Pa) was measured (PP 25mm, 25°C, 1Hz), as well as by frequency sweep in oscillation mode (?=0,01 at 100Hz, 25°C, ? =DL %).

Results:

The molar ratios diamine:acid and solubilizing block:structural block influence the melting point of the rheology modifier and the strength and stability of the gels formed in vegetable oils. Therefore, by adjusting both blocks, biobased gelling agents with different properties can

be obtained. As shown in Figure 3 (a), the rheological study of CCT, particularly in the presence of 4wt% of EstoGel Green, indicates the efficient gelling behavior of EstoGel Green at medium frequencies, as G'?G'', while flow, or the loss modulus (G''), predominates at low and high frequencies. Indeed, the viscoelastic behavior of the mixture is a function of the EstoGel Green concentration, as well as the type of oil used. As shown in Figure 3 (b) and (c), an important gelling effect is observed for different oils in the presence of EstoGel Green, with a particular behavior observed for Castor seed oil.

Conclusion :

A new 100% biobased oil rheology modifier has been developed.

This new ingredient allows the obtention of non brittle, transparent and sprayable gels with suspensive and rheofludifying properties and pleasant sensory touch;

Its versatility allows the development of various galenics (anhydrous formulas, emulsions, sticks?) for multiple applications. Moreover, it is COSMOS approved and China INCI Compliant.

## FIGURES

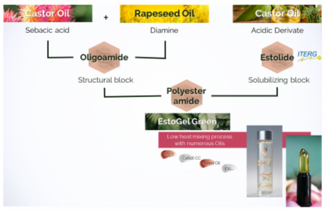

**Figure 1.** Schematic representation of the synthesis of EstoGel Green: condensation of bio-based diamine and sebacic acid to produce the structural block (oligoamide P2) and condensation of P2 and solubilizing block to produce the poly(esteramide).

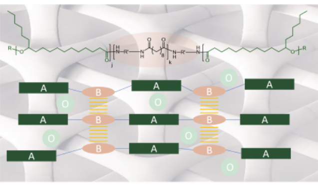

**Figure 2**. Oil (O) entrapment by supramolecular network formed by structural block (A) and solubilizing block (B)

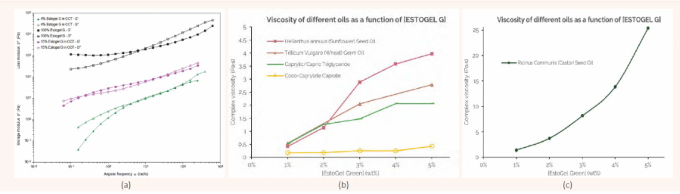

**Figure 3.** (a) Rheological study by frequency sweep (oscillation mode) of CCT in the presence of 50 and 4 wt% of EstoGel Green (ω=0.01, 100Hz, 25°C, γ =DL %); (b) and (c) evolution of viscosity of different oils as a function of the concentration of EstoGel Green (0.1Pa, PP 25mm, 25°C, 1Hz).

## FIGURE 1

Figure 1 and 2

Figure 1. Schematic representation of the synthesis of EstoGel Green: condensation of bio-based diamine and sebacic acid to produce the structural block (oligoamide P2) and condensation of P2 and solubilizing block to produce the poly(esteramide).

## FIGURE 2

Figure 3

## KEYWORDS

biobased polymers | rheology modifier | supramolecular chemistry | Gelling agent

## BIBLIOGRAPHY

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