

N°222 / OC

TOPIC(s) : Industrial chemistry / Polymers

## Synthesis and Characterization of ESTOLINE: Bringing Innovation to formulators through a smart combination of Green Chemistry and Functionalities

### AUTHORS

Philippe MARECHAL / STEARINERIE DUBOIS, ROUTE DE LA CREUSE, SCOURY

### PURPOSE OF THE ABSTRACT

Facing the urgency to reduce our environmental footprint, both customers and manufacturers are looking for multi-functional ingredients that could combine efficiency and a low consumption of natural resources.

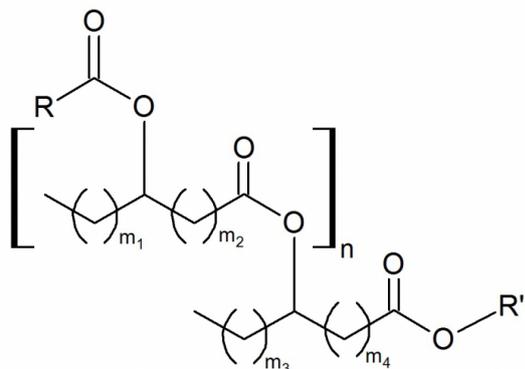
As an answer to that demand, the well-known reaction of esterification can still bring innovative solutions. Among the wide range of esters, we'll focus on estolides. In the last years, several types of estolides were synthesized by ingredients manufacturers, starting from vegetable fatty acids. Two main ways of reaction can be considered for obtaining these intermolecular esters, depending on the raw materials.

We developed the manufacturing a new range of estolide esters, named ESTOLINE, according to the Principles of Green Chemistry. These innovative ingredients are synthesized with as few transformations as possible, and engineered with the aim of creating a great versatility in applications, while keeping original functionalities. Our research challenge was fulfilled through the synthesis of new polymer esters, manufactured through Fisher's mechanism of esterification, based on castor oil. The performances of these estolide esters were screened from an instrumental point of view, and for cosmetics formulation, from sensorial description (generated by a trained panel). These new polymer esters have shown interesting properties, either as lubricants for the industry, or as ingredients for inventing new formulations for human well-being.

Characteristics such as a medium-range viscosity and a high stability versus oxidation are achieved. Beyond typical characteristics of lubricant additives, such as anti-wear properties, ESTOLINE bring to cosmetics formula a broad range of properties as a structuring or a film-forming agent, and give great moisturizing effects. These innovative molecules also show interesting behaviors as pigment dispersers. During application on hairs, skin, or lips, protective properties are obtained, and their use in the field of skin protection from the outer-air pollution can be considered.

Environmental impact of ESTOLINE was also investigated. Such manufactured new ingredients are quite biodegradable. In reference to the international standard implemented in 2017: ISO 16128, their NOI (Natural Origin Index) is 87% showing that ESTOLINE really presents a reduced environmental footprint and quite unique performances.

## FIGURES



**FIGURE 1**

General structure of estolide esters  
General structure of estolide esters

**FIGURE 2**

## KEYWORDS

Estolide esters | lubricants | cosmetic ingredients

## BIBLIOGRAPHY

Cermak, S. C. and T. A. Isbell (2001). "Synthesis of estolides from oleic and saturated fatty acids." *Journal of the American Oil Chemists' Society* 78(6): 557-565

Cermak, S. C. and T. A. Isbell (2002). "Physical properties of saturated estolides and their 2-ethylhexyl esters." *Industrial Crops and Products* 16(2): 119-127

Isbell, T. A. (2011). "Chemistry and physical properties of estolides." *Grasas y Aceites* 62(1): 8-20

Zerkowski, J. A. (2008). "Estolides: From structure and function to structured and functionalized." *Lipid Technology* 20(11): 253-256