



CHEMICALS SUBSTITUTION

NEWSLETTER #18
JANUARY 2020

COMING SOON

CREATION OF A NEW SUBSTITUTION SITE DEDICATED TO POLY- AND PERFLUOROALKYL SUBSTANCES

Already including bisphenols, phthalates and alkylphenol ethoxylates, the chemicals substitution website continues to expand its scope and will include in 2021 a new family of substances: poly- and perfluoroalkyl substances.

Poly- and perfluoroalkyl substances are a family of synthetic organic chemicals, including perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS).

Poly- and perfluoroalkyl substances are widely used because of the properties they give to materials: resistance to friction, heat, chemicals, water, etc. The main industrial sectors that use these substances include aerospace, defense, automotive, aviation, textiles, leather and clothing, construction, household products, electronics, firefighting, food and medical products.

Highly persistent and resistant to degradation, poly- and perfluoroalkyl substances are present in all compartments of the environment and in the food chain. This is the reason why these substances are subject to measures that aim at controlling their presence in the environment. Thus, five European countries (Germany, the Netherlands, Norway, Sweden and Denmark) proposed a joint [proposal for a REACH restriction to limit the risks to the environment and human health from the manufacture and use of a wide range of per- and polyfluoroalkyl substances \(PFAS\)](#).

You can already find information on uses of [PFOS](#), [PFOA](#) and their alternatives in two Ineris «technico-economic sheets» of INERIS. As in the case of already integrated substances, the aim of the future site of poly- and perfluoroalkyl substances substitution will be to relay available information that can provide concrete help to economic actors to achieve a sustainable substitution of these substances.

CARDANOL-BASED PLASTICIZERS: BIO- BASED ALTERNATIVES TO DINP?

Cardanol (CAS No. 37330-39-5) is one of the four main components of cashew nut shell liquid, also known as CNSL (see Figure 1). Cashew nuts are a product of the cashew tree, *Anacardium occidentale*, which is found in many parts of the world, such as Brazil, India, Bangladesh, Tanzania, Kenya, Mozambique, tropical Africa, Southeast Asia and the Far East.

Cardanol and its derivatives have many applications in the field of polymers (resins, polybenzoxazines...) and additives (antioxidants, surfactants...).

Thanks to its aromatic ring providing thermal stability and its C15 alkyl chain that can confer a plasticizing action, cardanol can represent an alternative to phthalates.

Nevertheless, some structural modifications are necessary to optimize its properties :

- / esterification of the phenol function of cardanol to obtain a good miscibility with PVC;

- / epoxidation of double bonds to improve the plasticizing properties and thermal stability of PVC.

Researchers from Institute of Charles Gerhardt Montpellier (ICGM), University of Montpellier, CNRS and National Superior School of Chemistry of Montpellier (ENSCM) have synthesized a series of plasticizers for PVC by esterification of cardanol with fatty acids followed by epoxidation of the unsaturations present on the alkyl

chains of cardanol and fatty acid (see Figure 2).

The mechanical and thermal properties of these plasticizers have been compared with those of DINP (diisononyl phthalate), a PVC plasticizer for the production of electrical wires, floor coverings, synthetic leathers, etc., whose use in toys and childcare articles and in materials in contact with foodstuffs is limited under Annex XVII of REACH. PVC plasticized with these additives would, according

to researchers, present better thermal stability and flexibility than with DINP.

Various applications are being considered by researchers for these cardanol-derived plasticizers: parts for car interiors, children's toys, food packaging, etc.

For more information:
<https://www.sciencedirect.com/science/article/pii/S0926669018311129?via%3Dihub>
 Techniques de l'ingénieur - Le cardanol : de l'huile de coque de noix de cajou à la chimie verte

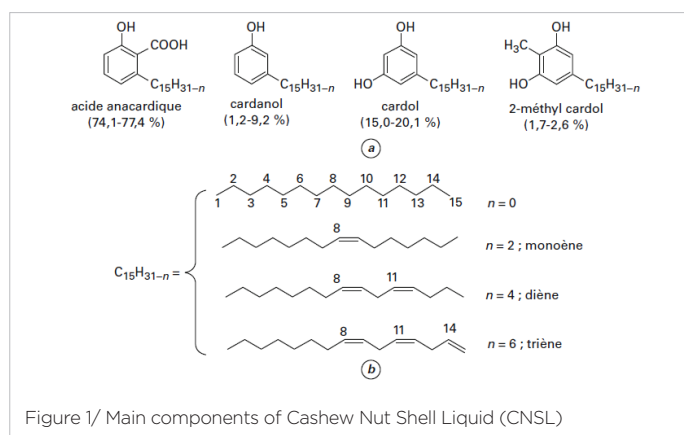


Figure 1/ Main components of Cashew Nut Shell Liquid (CNSL)

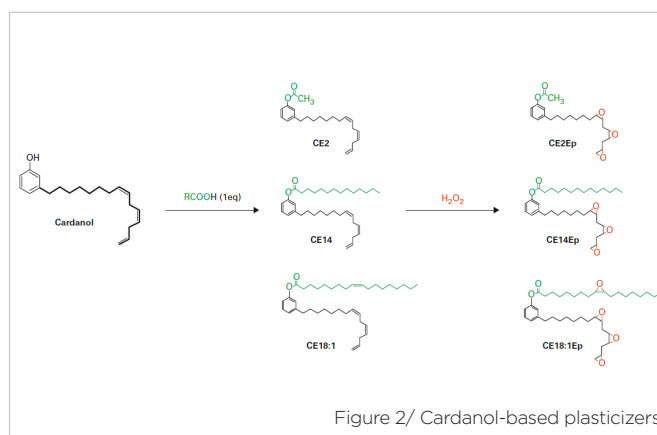


Figure 2/ Cardanol-based plasticizers

INTRODUCTION OF POLYMAX® 600 SERIES, A NEW GENERATION OF PHTHALATE-FREE POLYPROPYLENE POLYMERIZATION CATALYSTS

Polypropylene is obtained by polymerization of gaseous propylene in the presence of a catalyst system, usually the Ziegler-Natta catalyst or a metallocene.

The Ziegler-Natta catalyst is a titanium or zirconium based system containing diethyl phthalate, whose function is to control the iso-tacticity, i.e. the orientation of the monomers when they are attached to the polymer chain (methyl groups of the polymer are all on the same side of the chain). Phthalate-containing catalysts are considered a multi-purpose technology covering a wide range of properties and applications.

Last June, Clariant introduced Polymax 600 olefin polymerization catalysts based on magnesium chloride and titanium chloride and free of phthalates.

This patented innovation, jointly developed by McDermott's Novolen and Clariant, is based on McDermott's Lummus Novolen® technology. According to Clariant, Polymax 600

catalysts have high activity and high isotacticity. Moreover, according to their producer, the polymers produced with these catalysts :

- / have excellent mechanical properties (including impact resistance);
- / behaves similar to polymers manufactured with phthalate-based catalysts;
- / designed to suit a broad range of process requirements, in applications ranging from food packaging to engineered automotive parts.

Different particle sizes are available to fit the needs of a large polypropylene products portfolio

For more information:
<https://www.clariant.com/en/Corporate/News/2020/06/Clariant-introduces-new-phthalatefree-PolyMaxreg-600-Series-performance-catalysts-for-polypropylene>

NOURYON INTRODUCED A MULTIPURPOSE DISPERSING AGENT FOR THE FORMULATION OF PHYTOSANITARY PRODUCTS

An overview of APEO applications and alternatives was proposed in Newsletter

No. 15. They included alkyl phosphates, which are dispersants that can replace octylphenol ethoxylates (OPEOs) in the formulation of crop protection products.

Dispersants are co-formulants with no biological activity but whose role is to prevent the agglomeration of particles of active ingredients suspended in a liquid phase.

Last June, Nouryon launched the Agrilan 1015 dispersant (an alkoxyated phosphate ester) which, according to its producer, is:

- / Versatile - it can also be used as an emulsifying and wetting agent for water-based crop protection products formulations;
- / able to replace conventional products in the formulations of plant protection products suspended in water and seed treatment products;
- / biodegradable.

For more information:
<https://surfacechemistry.nouryon.com/markets/agrochemicals/agrilan-1015/>

PARU DERNIÈREMENT SUR LE SITE DE SUBSTITUTION DES SUBSTANCES CHIMIQUES...

/ ECHA - Video training on analysis of alternatives

/ Toys and childcare articles: entry into force of a restriction on DIBP

AGENDA

THE WATERBORNE SYMPOSIUM 2021 in New Orleans (United States) on 10th February 2021

The Waterborne Symposium is intended in particular for researchers and formulators in the field of coatings.

<https://www.waterbornesymposium.com/>

Forum PVC 2021 in Edinburg (United Kingdom) from 9 to 12 May 2021

Professionals of the PVC sector will be present, including possible producers/distributors of bisphenols and phthalates alternatives.

<https://www.iom3.org/events-awards/pvc-2021.html>

FESPA Global Print Expo 2021 in Amsterdam (Netherlands) from 12 to 15 October

The global federation of national associations for the screen printing, digital printing and textile printing will organize the FESPA Global Print Expo 2021 for professionals in the field of printing industry, which will offer the opportunity to learn about new technologies and innovative solutions in the different fields of printing that could potentially replace bisphenols, phthalates and alkylphenol ethoxylates.

<https://www.fespa.com/en/events/2021/global-print-expo-2021>

If you have any questions,
please contact us:
<https://substitution.ineris.fr/en/contact>

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