Chemicals substitution

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Editorial

The chemicals substitution website is extended to new substances.

The chemicals substitution website created in 2011 aimed initially at promoting the dissemination and sharing of information on the substitution of bisphenol A in food containers. Its mission was extended to other bisphenols and phthalates in 2016, and is now extended to new substances: alkylphenol ethoxylates (APEO).

Alkylphenols ethoxylates are a family of synthetic organic chemicals used in many industries for their surfactant properties. In the environment, nonylphenol and octylphenol, respectively degradation products of nonylphenol ethoxylates and octylphenol ethoxylates, are endocrine disruptors.

You can already find reference information on uses of nonylphenols ethoxylates and octylphenols ethoxylates and their alternatives in two "technical-economic data sheets" of INERIS, that will also be soon available in the "documentation" section of the French version portal that will be dedicated to them.

As for bisphenols and phthalates, we hope that the information about alternatives to alkylphenol ethoxylates we will relay will be a concrete help to economic actors to achieve sustainable substitution.

Substitution news

Researchers at the University of California have developed non-migrating plasticisers

In the production of flexible PVC, phthalates form a homogeneous mixture with PVC without chemical bonds binding the plasticizer to the polymer. Therefore, in the presence of fat, or under the effect of heat or friction, phthalates are likely to be emitted by the PVC.

A research team at University of California (UCSC[1]) has developed plasticizers chemically bonded to PVC. The innovation consists of replacing the benzene ring of the phthalate function with a triazole[2] ring (see Figure 1).

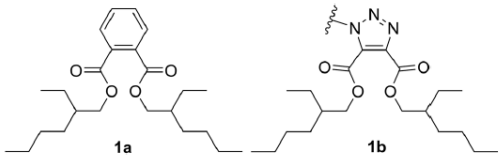

Figure 1. 1a Di-(2-ethylhexyl) phtalate (DEHP)
1b di-(2-ethylhexyl) triazole phtalate mimic

The plasticizer and the polymer are bond together at one of the triazole nitrogen atoms as shown in Figure 2. below.

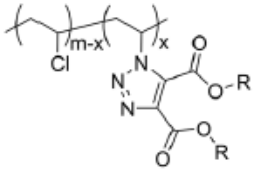

Figure 2. Bond between PVC and plasticizer developed by UCSC researchers

Two versions of this plasticizer have been developed: one dubbed "frog" and the other "tadpole" (see Figure 3 and Figure 4). According to the team of researchers, the plasticizer «frog» would be particularly promising because it would be much easier to produce than the plasticizer "tadpole" (its synthesis would require fewer steps and fewer reagents) and have better plasticizing properties.

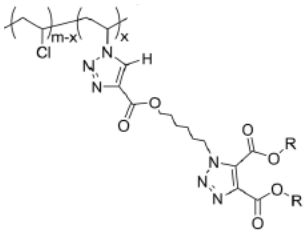

Figure 3. « Frog » plasticizer based on triazole, and its bond to PVC

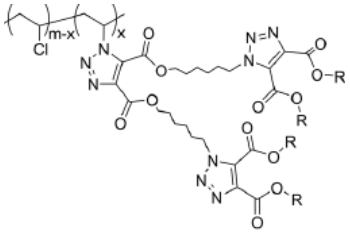

Figure 4. « Tadpole » plasticizer based on triazole, and its bond to PVC

Sources :
https://news.ucsc.edu/2018/11/phthalate-alternatives.html
https://onlinelibrary.wiley.com/doi/epdf/10.1002/pola.29205

An alternative to flexible PVC for food contact and some medical devices

Due to the difficulty of finding effective alternatives to phthalates in some flexible PVC applications, the appeal to an alternative material may be a solution. CELLENE™ TPE is a range of transparent thermoplastic elastomers (TPE) marketed by COLORITE. According to the latter, materials of the CELLENE™ TPE range combine the performance of vulcanized rubber with the processing properties of thermoplastics (injection molding and extrusion). These TPEs are formulated using raw materials that are FDA[3] and USP Class VI and ISO 10993 standards compliant and that are silicone free, latex free, phthalate free and halogen free.

According to COLORITE, the products of the CELLENE™ TPE range are able to replace flexible PVC for the production of a wide variety of medical devices due to their transparency (necessary for the monitoring of fluids), their kink resistance, low migration and drug absorption. In addition, these TPEs are sterilizable by gamma radiation, steam, and ethylene oxide (EtO). COLORITE has listed medical devices for which the CELLENE™ range can be an alternative to PVC for peristaltic tubing (transfusion, drainage, catheters, intravenous infusions, enteral feed), (bags, solution, enteral feed, blood), needle septum, film and sheet.

Moreover, the products of the CELLENE™ range can be, according to its manufacturer, intended for production of food packaging (flexible containers), tubing, rings or seals for the food industry and baby care articles (bottle nipples, pacifiers).

Source :
http://www.tekni-plex.com/2018/10/23/colorite-highlights-cellene-tpe-compounds-for-medical-devices-at-medica/

Teysha Technologies develops biopolycarbonates using monomers from biosourced raw materials

The Teysha Technologies company has developed an alternative to bisphenol A-based polycarbonates such as those used in the automotive, aviation, construction, medical device industries, etc. These biopolycarbonates are composed of:

- monomers and comonomers from biosourced raw materials (such as starches and agricultural waste);
- carbonates as linkages between the monomers and comonomers.

Two types of polyhydroxy monomers, saccharides and quinic acid, have been tested to produce these polycarbonates. The polymerization of these two monomers can produce a wide range of linear and hyperbranched polymers and copolymers.

According to the researchers, one of the major advantages of the technology lies in its "tunability": in addition to comonomers, various solvents and additives can be used to modify the properties of the final polymer, allowing users to adapt the physical, mechanical and chemical properties (wear resistance, ductility...) of these polymers according to their application. According to Teysha Technologies, this technology can produce rigid or flexible biopolycarbonates with different thermal properties.

This adaptability would enable the production of a wide variety of finished products, from medical implants to automotive interior equipment, to food packaging and construction coatings.

The company does not provide evidence of industrial application, and rather seems to be looking for partners to develop early industrial applications.

Source :
https://teyshatech.co.uk/

Coming soon

INTERPLASTICA 2019 in Moscow (Russia) from January 29th to February 1st, 2019
Latest trends and innovations for plastics and rubbers.
https://www.interplastica.de/

EUROPEAN COATINGS SHOW 2019 in Nuremberg (Germany) from March 19th to 21th, 2019
This salon will bring together paints and coatings formulators, and will be an opportunity to learn about the latest innovations that could replace bisphenols, phthalates, and ethoxylated nonylphenols for these applications.
https://www.european-coatings-show.com/

FESPA Global Print Expo 2019 in Munich (Germany) May 14th to 17th, 2019
FESPA is a trade fair for printing industry professionals and offers the opportunity to learn about new technologies and innovative solutions that could potentially replace phthalates in the field of textile printing.
https://www.fespa.com/en/events/2019/fespa-global-print-expo-2019

(1) *UCSC : University of California, Santa Cruz*
(2) *Un cycle triazole est un composé organique cyclique à cinq atomes comportant deux doubles liaisons et trois atomes d'azote (formule brute C2H3N3)*
(3) *Food and Drug Administration*

1,2,4-triazole
(n° CAS : 288-88-0)