PFC-free alternatives for water repellent textile finishes

Abstract

Due to the fact that several perfluorinated compounds are known to be persistant, bioaccumulative and hazardous to human health, G-Star has committed to phase out this chemistry and substitute it by Fluorine-free alternatives

Substituted substance(s)

Perfluorooctanoic acid (PFOA)
CAS No. 335-67-1

Perfluorooctane sulfonic acid (PFOS)
CAS No. 1763-23-1

Perfluorohexanesulfonate (PFHXS)
CAS No. 335-46-4

Perfluorobutanesulfonate (PFBS)
CAS No. 375-73-5

Classification

Sbstances have no harmonised classification according to Annex VI of Regulation (EC) No 1272/2008 (CLP Regulation)
ECHA's Classification and Labelling Inventory

Hazard assessment

In order to obtain water repellency fluorocarbon chemistry has been widely applied. Many polyflulorocarbons pose severe risks to human health, but also to the environment.
PFOS is under suspect of causing cancer, may cause harm to breast-fed children, may damage the unborn child, and is toxic to aquatic life with long term effects. In addition PFOS is considered to be a PBT substance.
PFOA formed during production of fluorocarbons is classified as critical as well.

Substitution description

Water repellency on textile is a key for brands, especially in the field of outdoor jackets. Perfluorinated chemicals (PFCs) form a group of chemicals that has many specialty applications. They can provide resistance to heat, to other chemicals or to abrasion, and they can be used as dispersion, wetting or surface treatments.

Certain PFCs are of concern around the world because they are not broken down in the environment and can persist for a long time, accumulating to levels that can be harmful to living systems. Substitutions are driven by the precautionary principle process.

G-Star's management decided and committed that a phase out of PFC chemistry is needed for all products which require a water repellency function as of January 2015.
Intense investigations have been done on alternatives, e.g. dentimers, dispersions of modified fat-compounds and certain paraffin waxes. Today it remains still a challenge as all alternatives on the market do not show the same performance affects as PFC chemistry. Another obstacle for smaller companies is that small quantities may face the problem of cross contamination as at this moment in time dedicated production lines cannot be guaranteed. This is due to the fact that contracted mills are still operating with PFC chemistry. Cross-contamination of production lines is therefore likely as the industry is at its beginning of the phase out.

Case/substitution evaluation

G-Star's own investigations has shown that alternative chemistry on the market do meet our companies performance criteria. Our findings showed that the most suitable product to accimplish durable water repellency is the modified paraffins. Good results could be achieved on fabrics, also after several times of washing. Our recommendations and findings have been shared with our entire supply chain in order to ensure a successful implementation.