

Poloxamer Surfactants: Oral Care Preparations and Beyond

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Abstract

This article will describe the key properties of a class of surfactant, Poloxamers, that are little known outside of the pharmaceutical and oral care area. Poloxamers (marketed under the Pluracare® Surfactant trade name by BASF Corporation) are based on ethylene and propylene oxide chemistry. Although this chemistry has been known for a long time, the properties of these compounds are not often recognized by cosmetic formulators. The article offers essentially a technical review and it also includes formulation tips.

Introduction

The INCI name Poloxamer describes a linear block copolymer (Figure 1), the two monomers used to create the polymer are ethylene oxide (EO) and propylene oxide (PO). Although the difference is only one methyl (-CH₃) group this is enough to make PO a more hydrophobic moiety than EO and enough to make a EO-PO-EO block copolymer into a surfactant (surface active agent).

The ether bond between the monomers is very stable and these compounds display outstanding chemical stability even to harsh conditions.

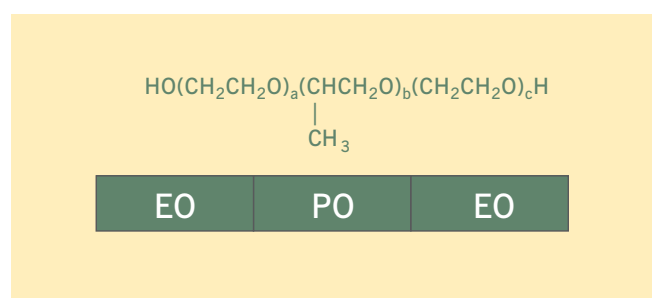


Figure 1: EO-PO-EO block copolymer

Typical applications

- Mouthwash
- Toothpaste
- Tooth-whitening products
- Pharmaceutical dosage forms

- Skincare formulations
- Household and industrial products
- Solubilizers and emulsifiers

Overview of the properties of Pluracare Surfactants

- Water soluble or dispersible
- Low toxicity
- No irritation /irritation mitigation
- Ability to form an aqueous gel (particularly Pluracare F 127)
- Colourless, odourless and tasteless
- Easily rinsed
- May help to improve mouth-feel
- Low hygroscopicity

Pluracare Surfactant grades are available in a variety of molecular weights and EO/PO ratios (Figure 2). They can be in the form of solids, pastes or liquids; they span a wide range of HLB values making them a truly versatile class of compounds.

Figure 3 shows the functionality of each of the Pluracare Surfactant grades. The following sections detail some of the most prominent applications and features of this class of compounds.

Solubilization

Pluracare F 127 Surfactant, Pluracare F 108 Surfactant and Pluracare F 68 Surfactant are solubilizers for a variety of fragrance compounds, essential oils and pharmaceutical actives. Typical concentration: 0.2 to 1.0% w/w.

Recommended use levels for Pluracare F 127 Surfactant to solubilize selected oils in water: for 0.2% cinnamon oil or clove oil use about 0.3%, for 0.2% peppermint oil use 0.5%.

Mildness

Pluracare Surfactants, in general, have been proven to be mild to the skin and to the eye; in addition, they have low acute toxicity and low potential to cause irritation or sensitization.

Pluracare F127 Surfactant or Pluracare F 108 Surfactant, used at concentrations of 2-5% w/w, help to mitigate the irritation of dentifrice formulations containing harsh surfactants, e.g.: