



TECHNICAL BULLETIN

Zemea® Propanediol for Oral Care

Introduction

Zemea® propanediol is a natural, petroleum-free humectant and solvent for formulators who desire versatile and innovative ingredients for oral care applications. Zemea® propanediol is ideally suited for both mouthwash and toothpaste applications. In mouthwash, it enables the formulation of a variety of clear, good-tasting, alcohol-free products. In toothpaste, it enables the formulation of clear, good-tasting, Sodium Lauryl Sulfate free products (SLS-free). It also provides processing advantages including the prevention of localized gelling of nonionic solubilizer surfactants.

Background

There has been a push to lower the alcohol levels of mouthwash products with the goal of eliminating ethanol altogether. With low or no alcohol, the development and manufacture of appealing, good-tasting mouthwash becomes difficult. Alcohol in mouthwash brings many benefits as it helps dissolve the flavors and antiseptic agents in water, has preservative properties, brings forth its own freshening sensation, and helps lift the sensation of the flavor and antiseptic agents. Without alcohol, a greater burden is placed on the surfactant solubilizer to achieve clarity of the flavors and antiseptic agents in water. Such popular nonionic surfactant solubilizers as Polysorbate 80 have a characteristic unpleasant taste when used at higher concentrations. Furthermore, most solubilizers exhibit localized gelling when added to water. There is appeal in the marketplace for alcohol-free mouthwash formulations that are clear and have an appealing taste.

Sodium Lauryl Sulfate is the industry standard as a good-tasting, foaming agent in toothpaste. However, there are concerns and studies linking increased frequency of aphthous ulcers and limiting bioavailability of fluoride to SLS use in toothpaste. For well over a decade, companies have wanted to be able to claim “SLS-free” on toothpaste labels. There now is a whole category of foam-free toothpastes, but none have hit the mainstream. Alternative foaming surfactants offer the toxicity profile desired, but generally fall short mainly due to poor tasting and foaming characteristics. There is eagerness in the marketplace for toothpaste formulations, preferably gels, that are SLS-free, taste great, and foam reasonably well.

Formulating for Success

Zemea® Propanediol in Mouthwash Applications

Important for mouthwash applications, Zemea® propanediol eliminates localized gelling characteristics exhibited by the popular, effective surfactant solubilizer Polysorbate 80 when it is first added to water. Best practice is to blend insoluble flavors and antiseptic agents with the solubilizer prior to the addition of water; however, when Zemea® propanediol is included in the blend, the mixture is immediately clear in the water with minimal agitation. The use of 20% Zemea® propanediol (50% for antiseptic mouthwash) in an alcohol-free mouthwash reduces the level of Polysorbate 80 needed to solubilize flavors and antiseptic agents. Without the addition of Zemea® propanediol, the level of Polysorbate 80 needed for clarity increases resulting in a poor-tasting product with a bitter, soapy aftertaste. When humectants such as sorbitol, glycerin, or PEG-6 are used at comparable levels to Zemea® propanediol, the alcohol-free mouthwashes are not as clear and produce a “flat” taste.

Zemea® Propanediol in Toothpaste Applications

For toothpaste applications, Zemea® propanediol is best combined with sorbitol for the creation of SLS-free formulations with good taste, gel characteristics, and foaming. Zemea® propanediol is an effective solvent for sorbitol and sweeteners eliminating the worry that they will not fully dissolve in the water. Zemea® propanediol is also a carrier for gums. Cellulose gum and Xanthan gum are widely used in toothpaste formulations and when directly added to water exhibit localized gelling. Mixing gums in Zemea® propanediol first, then adding the mixture to the formulation eliminates the problem. Additionally, Zemea® helps improve the taste of a toothpaste formulation and allows for gel toothpastes with clarity and rheology.

Conclusions

The use of Zemea® propanediol in oral care applications is advantageous. Eight new formulations were created using the techniques discussed in this technical bulletin. The use of 20% Zemea® propanediol in alcohol-free mouthwashes enables new formulation development of classic, antiseptic, and therapeutic products. The addition of Zemea® propanediol eliminates solubilizer gelling, reduces the surfactant load, improves taste, and enables formulation clarity. The portfolio of formulations includes a basic alcohol-free, an antiseptic, a tartar reducing, and a dry mouth product.

Using Zemea® propanediol at levels slightly less than 30% in SLS-free toothpaste formulations along with crystalline sorbitol enables relatively easy processing of good tasting and foaming gel toothpastes. The addition of Zemea® propanediol acts as a effective solvent for sorbitol and sweeteners, carrier for gums, improves the taste, and allows for excellent clarity and rheology. The portfolio of formulations includes a SLS-free gel toothpaste with high foaming and great taste, a SLS-free gel toothpaste using a naturally-derived foamer, and a remineralizing opaque SLS-free toothpaste.

All formulations are available in the oral care formulation brochure available on the DuPont Tate & Lyle Bio Products website.

For additional information or samples:

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