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Diisononyl Phthalate Overview

Diisononyl Phthalate (DINP) $C_{6}H_{4}(COOC_{9}H_{19})_{2}$, is a clear, colorless, and almost odorless liquid chemical. It is soluble in most organic solvents. DINP is primarily used as a PVC plasticizer. As compared to DOP, the low volatility and better durability of DINP significantly reduces the fume emissions during the processing procedure and improves its permanence in the final product.

DINP is a mixture of isomers that have alkyl chains from 7 to 9 carbons long, but the largest portion of the mixture have chains composed of 8-carbon in length (a.k.a. isononyl alcohol).

DINP is a general purpose plasticizer with a broad range of applications used in flexible PVC. It is widely used in the toy, construction, and general consumer product markets. It has limited use in food packaging and is not used in medical applications.

Plasticizer Overview

Plasticizers are polymer additives that serve to increase the polymer's flexibility, elongation and ease of processing. In other words, they make the polymer more workable. In technical terms, the addition of a plasticizer generally causes a reduction in the cohesive intermolecular forces along polymer chains. The chains can then move more freely relative to one another, hence reducing the stiffness of the polymer.

The use of plasticizers began in the mid 1860s when castor oil was added to Cellulose Nitrate. The most commonly measured physical effects include melt viscosity, elasticity modulus, and the glass transition temperature. Other types of plasticizers have been used through the years, but in the late 1930s, phthalates were introduced because they were believed to be less toxic. The two most common plasticizers used today are di-2-ethylhexyl phthalate (DEHP) and di-isononyl phthalate (DINP). Both of which are generally used in the manufacture of PVC related products.

The Phthalate Plasticizer Market

In 1999, the global volume of plasticizers was approximately 10 billion lbs., or about \$5 billion, The market has had an average yearly growth rate of 2-3 percent.

Of these plasticizers, standard phthalate esters comprise over 85 percent of the tonnage produced every year. Phthalates command the market due to their low cost, ease of use and availability. Other common plasticizers include adipates, polymeric and trimellitates.

Over 90 percent of plasticizer volume goes into flexible PVC applications. Plasticized PVC polymer is found in a wide variety of products including food packaging, construction materials, toys, and medical devices. Yet PVC in its "true" form is a hard, brittle polymer used in PVC pipe for the construction industry.