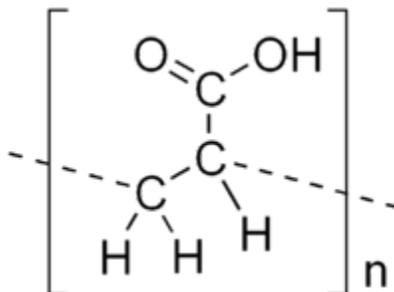


POLYACRYLIC ACID

Introduction



Poly(acrylic acid) or PAA (CAS number 9003-1-04) is a type of [polymer](#). The monomer of poly(acrylic acid) is [Acrylic Acid](#). In a water solution at neutral pH, many of the side chains of PAA will lose their protons and acquire a negative charge.

Dry PAA is a white solid. It is capable of absorbing many times its weight in water, and hence is used in disposable diapers. In [diapers](#) it is a fine powder - see picture of material form a diaper.

Chemical Properties

Polyacrylic acid is a large-molecular-weight compound called a polymer, which consists of small repeating units called monomers. The polyacrylate polymer used in diapers is constructed from the acrylic acid and sodium acrylate monomers. The length of the polymer chain and the properties of the polymer may be changed by varying the reaction conditions. The reaction conditions can affect the the length of the chains and can change the characteristics of the polymer. The polyacrylate is dried and formed into microparticles of irregular shape that are stable for extended periods. The particles quickly swell and absorb water, urine, or other aqueous solutions.

History

A super-absorbent (SAP) or polyacrylic acid was patented in 1966 by Gene Harper of Dow Chemical and Carlyle Harmon of Johnson & Johnson. It was first used in diapers in 1982 in Japan.

Uses

Polyacrylic acid is found in a wide variety of household and personal care products:

- ♣ [Diapers](#)
- ♣ Hand sanitizer
- ♣ Mascara
- ♣ Aftershave
- ♣ Toothpaste
- ♣ Hair-styling products (gels, dyes, sprays)
- ♣ Moisturizer
- ♣ Pet shampoo
- ♣ Metal polish

Toxicity

Human Health Effects

Products containing polyacrylic acid warn of a mild irritation if eye or skin exposure occurs. Not meant for skin contact.

Material Safety Data Sheets (MSDSs) for Polyacrylic Acid

A common statement on MSDSs is "To the best of our knowledge the chemical, physical & toxicological properties have not been thoroughly investigated."

- ♣ [Fisher Scientific - MSDS CAS# 9003-01-4](#) - indicates benzene as possible contaminant
- ♣ [Chemical book CAS# 9007-20-9](#) - minimal information
- ♣ [] - indicates benzene as possible contaminant
- ♣ [Poly\(acrylic acid\) Sodium Salt - 9003-04-7](#)
- ♣ [American Polymer Standards Corporation - 9003-04-7](#)

Manufacture

Note that the polyacrylic acid contains some of the monomer acrylic acid.

Information from [Chemquat](#) and their website on [Polyacrylic acid](#)

Polyacrylic Acid

IUPAC Name: acrylic acid

CAS Number: 9003-01-4

Chemical Formula: C₃H₄O₂

Appearance: colorless to pale yellow transparent solution

Solid content, % 25-42

Free monomers as acrylate: 0.5% max

Molecular weight 1200-100000

pH of 1% solution: 3.0 max

Specific gravity; g/cm³: 1.15 min

Packing 200l plastic drum

Gross weight 260kg

Net weight 250kg

Regulation

- ♣ Polyacrylic acid is regulated under the US EPA [Toxic Substances Control Act \(TSCA\)](#).
- ♣ Polyacrylic acid is monitored by the [International Agency for Research on Cancer](#), an agency of the World Health Organization.
- ♣ Polyacrylic acid, sodium salt is listed as a food additive by the US [Food and Drug Administration \(FDA\)](#).

Source : <http://www.toxipedia.org/display/toxipedia/Polyacrylic+Acid>