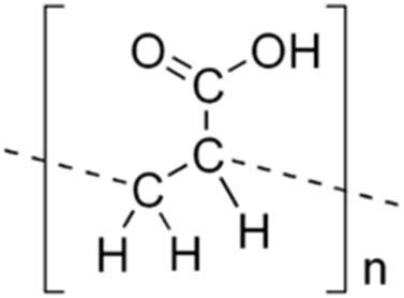
Polyacrylic Acid
updated Jun 28, 2010 by Maria Mergel
TXP-3
Introduction



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).

References

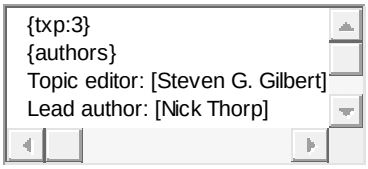
U.S. Department of of Health and Human Services Household Products Database: Polyacrylic acid

U.S. Food and Drug Administration: Everything Added to Foods in the United States

Cool Science website: Diapers - Short introduction to SAP and diapers

University at Buffalo, the State University of New York: Course project for CE435, Introduction to Polymers - Dated page (from 1999), but contains data on manufactures at the time

University of Southern Mississippi Polymer Science Learning Center: Acrylates - Explains the chemistry of different configurations



Bottom of Form
Attachment Adjustments
Polyacrylic.4.jpg
Polyacrylic_acid.png

Friends

User Guide
Contribute

Topic List
Aquatic Farming
Chemical Weapons
Glossary
Toxipedia
Authors
Topic editor
Steven G. Gilbert
Lead author
Nick Thorp
Topic List
Advocacy Organizations
Animal & Plant Toxins
Aquatic Farming
Biomimicry
Biomonitoring
Book Resources
Chemical Weapons

Chemicals List
Acetone
Barium Compounds
Chemical Toxicity Databases
Chlorinated Paraffins
Chlorobenzylidene-malononitrile
Cyanide Compounds
Cyhalothrin
Dimercaprol
Disulfoton
Endosulfan
Ethyl Alcohol
Ethylmercury
Fenitrothion
Fensulfothion
Furans
Glyphosate
Benzene
Hexachlorophene
Iodine
Caffeine
Isopropyl Acetate
Methyl Isocyanate
PCBs
Pentachlorophenol
Phosphine
Polyacrylic Acid
Tellurium Compounds
Terbufos
TOCP
Trichlorfon
Diethanolamine (DEA)
Diacetyl
Fluoride
Hydrazine
polonium 210
Hazard Rankings
Melamine
Mercaptans
Perfluorooctanesulfonic acid
Tetrodotoxin
Children's Environmental Health
Dietary Supplements

Diseases and Disorders
Drugs and Pharmaceuticals
Endocrine Disruptors
Ethical Considerations
Food Ingredient and Health Research Institute
Fracking
Glossary
Google Maps on Toxipedia
Green Chemistry
Greenhouse Effect
History of Toxicology
Integrated Pest Management
Laws and Regulation
Local Issues (Washington State)
Metals
Multiple Chemical Sensitivity
Nanotechnology
Neurobehavioral Testing
Neurotoxicology
P2RIC's SustainUpdates
Persistent Environmental Contaminants
Pesticides
Plasticizers
Pregnancy and Developmental Toxicology
Products of Interest
PVC
Radiation
Resources on Religion and the Environment
Risk Assessment and Risk Management
Scientific and Professional Organizations
Solvents - Chemical Profiles and External Links
SOTwiki
Teaching Resources
This Is My Health
Toxic Chemicals in Household Products
Toxics in the Home
US Toxic Sites & Resources
Other Topics
Toxicology History Association
Epigenetics
Composting
Chlorinated Tris (TDCPP)
Flame-Retardants