Kirk-Othmer Encyclopedia of Chemical Technology.

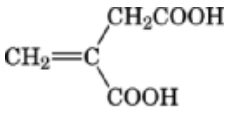
ITACONIC ACID AND DERIVATIVES

Itaconic acid[97-65-4] (methylenebutanedioic acid, methylenesuccinic acid) is a crystalline, high melting acid (mp = 167 − 168) produced commercially by fermentation of carbohydrates (1–4). Itaconic acid is produced in the broth from citric acid (qv). Isolated from the pyrolysis products of citric acid in 1836, this α-substituted acrylic acid received its name by rearrangement of aconitic, the acid from which it is formed by decarboxylation.

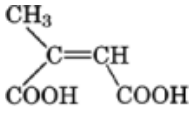
1. Physical and Chemical Properties

The dissociation constants in H_2O at 25°C of itaconic acid are as follows: $K_1 = 1.40 \times 10^{-4}$; $K_2 = 3.56 \times 10^{-6}$ (5). Heat of formation is 840 kJ/mol (201 kcal/mol) and heat of combustion is 1980 kJ/mol (473 kcal/mol) (6). Its solubility is 9.5 g/100 mL H_2O at 25°C and increases with temperature and pH (7).

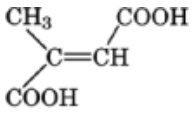
Itaconic acid (**1**) is isomeric with citraconic [498-23-7] (**2**) and mesaconic [498-24-8] (**3**) acids. Under acidic, neutral, or mildly basic conditions and at moderate temperatures, itaconic acid is stable. At elevated temperatures or under strongly basic conditions, the isomers are interconvertible.



(**1**)



(**2**)



(**3**)

Itaconic acid, anhydride, and mono- and diesters undergo vinyl polymerization. Rates of polymerization and intrinsic viscosities of the resulting homopolymers are lower than those of the related acrylates (see Acrylic ester polymers) (8, 9).

2. Uses

Itaconic acid is a specialty monomer that affords performance advantages to certain polymeric coatings (qv) (see Polyesters, unsaturated). Emulsion stability, flow properties of the formulated coating, and adhesion to substrates are improved by the acid. Acrylonitrile fibers with low levels of the acid comonomer exhibit improved dye receptivity which allows more efficient dyeing to deeper shades (see Acrylonitrile polymers; Fibers, ACRYLIC) (10, 11). Itaconic acid has also been incorporated in PAN precursors of carbon and graphite fibers (qv) and into ethylene ionomers (qv) (12).

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Related Articles

Polyesters, unsaturated; Acrylic ester polymers