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22 Date of Revision

4 May 2017.

Alpha Tocopherol

1 Nonproprietary Names

BP: all-*rac*-α-Tocopherol
JP: Tocopherol
PhEur: all-*rac*-α-Tocopherol
USP–NF: Vitamin E
See also Sections 3, 9, and 17.

2 Synonyms

Copherol F1300; (±)-3,4-dihydro-2,5,7,8-tetramethyl-2-(4,8,12-trimethyltridecyl)-2*H*-1-benzopyran-6-ol; E307; synthetic alpha tocopherol; *dl*-α-tocopherol; int-*rac*-α-tocopherol; 5,7,8-trimethyltocol.

3 Chemical Name and CAS Registry Number

(±)-(2*RS*,4'*RS*,8'*RS*)-2,5,7,8-Tetramethyl-2-(4',8',12'-trimethyltridecyl)-6-chromanol [10191-41-0]

Note that alpha tocopherol has three chiral centers, giving rise to eight isomeric forms. The naturally occurring form is known as *d*-alpha tocopherol or (2*R*,4'*R*,8'*R*)-alpha-tocopherol (*see* Section 17). The synthetic form, *dl*-alpha tocopherol or simply alpha tocopherol, occurs as a racemic mixture containing equimolar quantities of all the isomers.

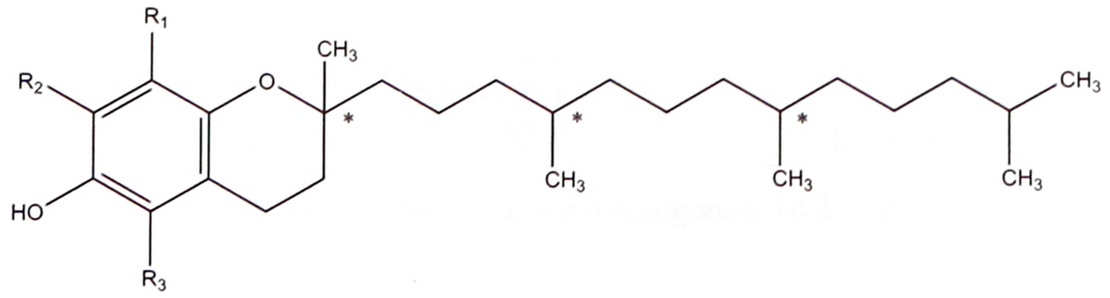
Similar considerations apply to beta, delta, and gamma tocopherol and tocopherol esters.

See Section 17 for further information.

4 Empirical Formula and Molecular Weight

$C_{29}H_{50}O_2$ 430.72

5 Structural Formula



Alpha tocopherol: $R^1 = R^2 = R^3 = CH_3$
Beta tocopherol: $R^1 = R^3 = CH_3$; $R^2 = H$
Delta tocopherol: $R^1 = CH_3$; $R^2 = R^3 = H$
Gamma tocopherol: $R^1 = R^2 = CH_3$; $R^3 = H$
* Indicates chiral centers.

6 Functional Category

Antioxidant; nonionic surfactant; plasticizing agent.

7 Applications in Pharmaceutical Formulation or Technology

Alpha tocopherol is primarily recognized as a source of vitamin E, and the commercially available materials and specifications reflect this purpose. While alpha tocopherol also exhibits antioxidant properties,[1,2] the beta, delta, and gamma tocopherols are considered to be more effective as antioxidants.

Alpha tocopherol is a highly lipophilic compound, is an excellent solvent for many poorly soluble drugs,[3–6] and can increase the stability of formulations.[7] Of widespread regulatory acceptability, tocopherols are of value in oil- or fat-based pharmaceutical products and are normally used in the concentration range 0.001–0.05% v/v. There is frequently an optimum concentration; thus the autoxidation of linoleic acid and methyl linolenate is reduced at low concentrations of alpha tocopherol, and is acceler-