

Propylene Carbonate

1 Nonproprietary Names

USP–NF: Propylene Carbonate

2 Synonyms

Carbonic acid; cyclic methylethylene carbonate; cyclic propylene ester; cyclic propylene carbonate; 4-methyl-2-oxo-1,3-dioxolane; 2-oxo-4-methyl-1,3-dioxolane; 1,2-propanediol cyclic carbonate; 1,2-propylene carbonate.

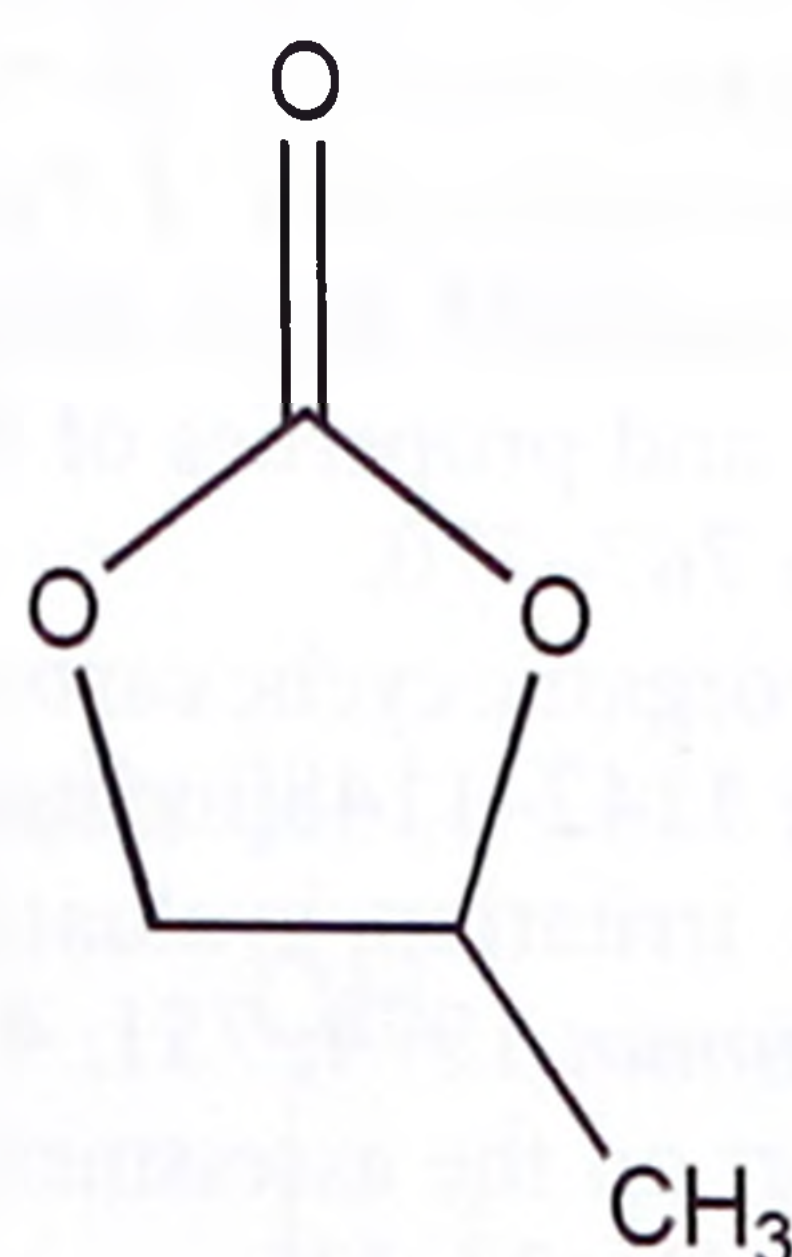
3 Chemical Name and CAS Registry Number

±-4-Methyl-1,3-dioxolan-2-one [108-32-7]

4 Empirical Formula and Molecular Weight

C₄H₆O₃ 102.09

5 Structural Formula



6 Functional Category

Solvent.

7 Applications in Pharmaceutical Formulation or Technology

Propylene carbonate is used mainly as a solvent in oral and topical pharmaceutical formulations.

In topical applications, propylene carbonate has been used in combination with propylene glycol as a solvent for corticosteroids. The corticosteroid is dissolved in the solvent mixture to yield microdroplets that can then be dispersed in petrolatum.⁽¹⁾ Propylene carbonate has been used as a dispensing solvent in topical preparations.⁽²⁾

Propylene carbonate has also been used in hard gelatin capsules as a nonvolatile, stabilizing, liquid carrier. For formulations with a low dosage of active drug, a uniform drug content may be obtained by dissolving the drug in propylene carbonate and then spraying this solution on to a solid carrier such as compressible sugar; the sugar may then be filled into hard gelatin capsules.⁽³⁾

Propylene carbonate has also been used to investigate drug release from rapamycin-loaded micellar copolymers.^(4,5)

8 Description

Propylene carbonate is a clear, colorless, odorless, mobile liquid.

9 Pharmacopeial Specifications

See Table I.

10 Typical Properties

Boiling point 242°C

Dielectric constant 66.14 (15–30°C)

Flash point 135°C

Freezing point –48.8°C

Table I: Pharmacopeial specifications for propylene carbonate.

Test	USP 40–NF 35 S1
Identification	+
Specific gravity at 20°C	1.203–1.210
pH ^(a)	6.0–7.5
Residue on ignition	≤0.01%
Assay	99.0–100.5%

(a) 10% v/v aqueous solution with 0.3% saturated KCl.

Heat of combustion 14.21 kJ/mol (3.40 kcal/mol)

Heat of vaporization 55.2 kJ/mol (13.2 kcal/mol) at 150°C.

Refractive index $n_D^{20} = 1.4189$

Solubility Practically insoluble in hexane; freely soluble in water. Miscible with acetone, benzene, chloroform, ethanol, ethanol (95%), and ether.

Specific heat 2.57 J/g°C (0.62 cal/g°C) at 20°C.

Spectroscopy

IR spectrum *see* Figure 1.

Raman spectrum *see* Figure 2.

Vapor pressure 4 Pa (0.03 mmHg) at 20°C.

Viscosity (dynamic) 2.5 mPa s (2.5 cP) at 25°C.

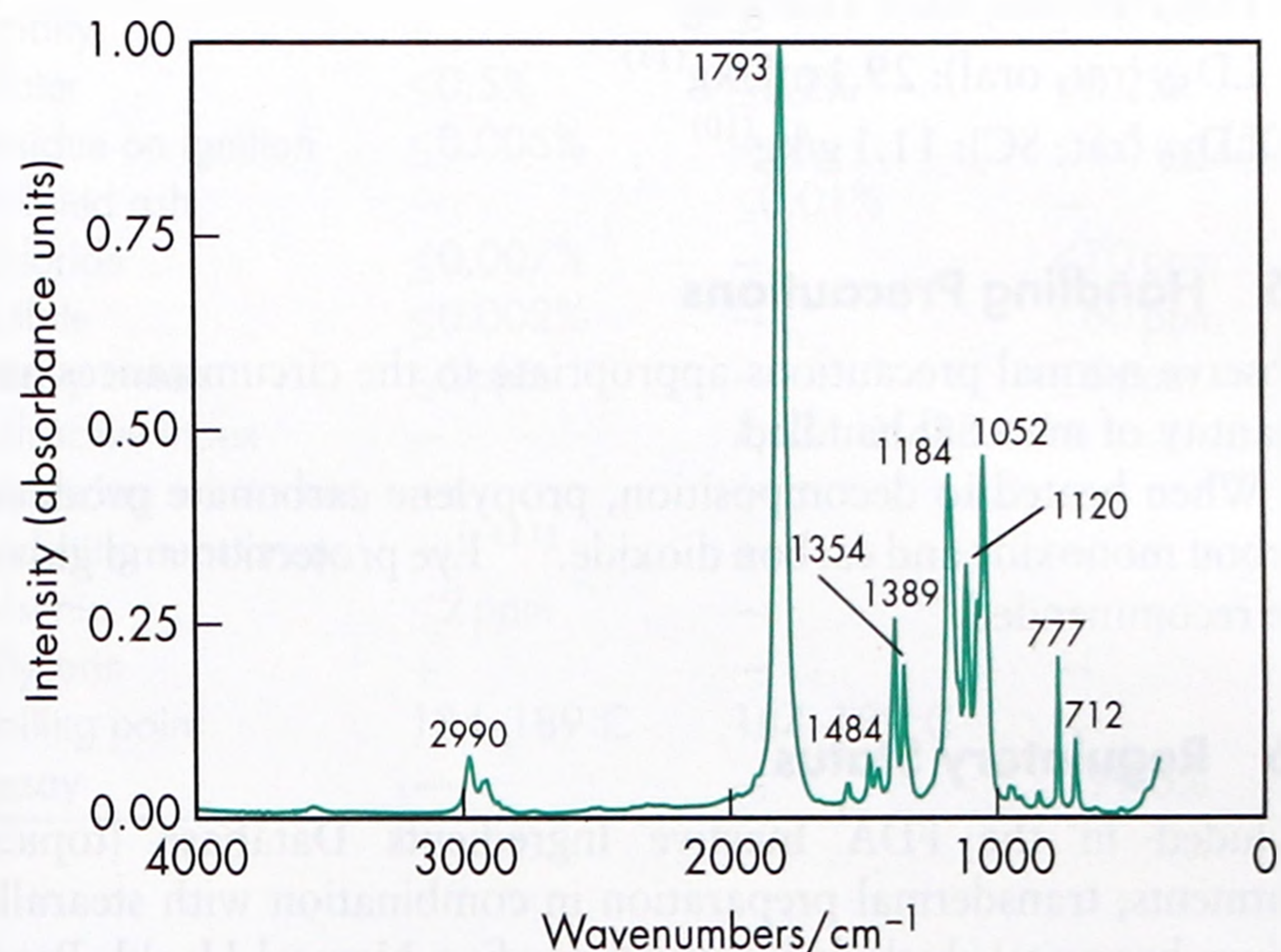


Figure 1: Infrared spectrum of propylene carbonate measured by transmission. Adapted with permission of Informa Healthcare.

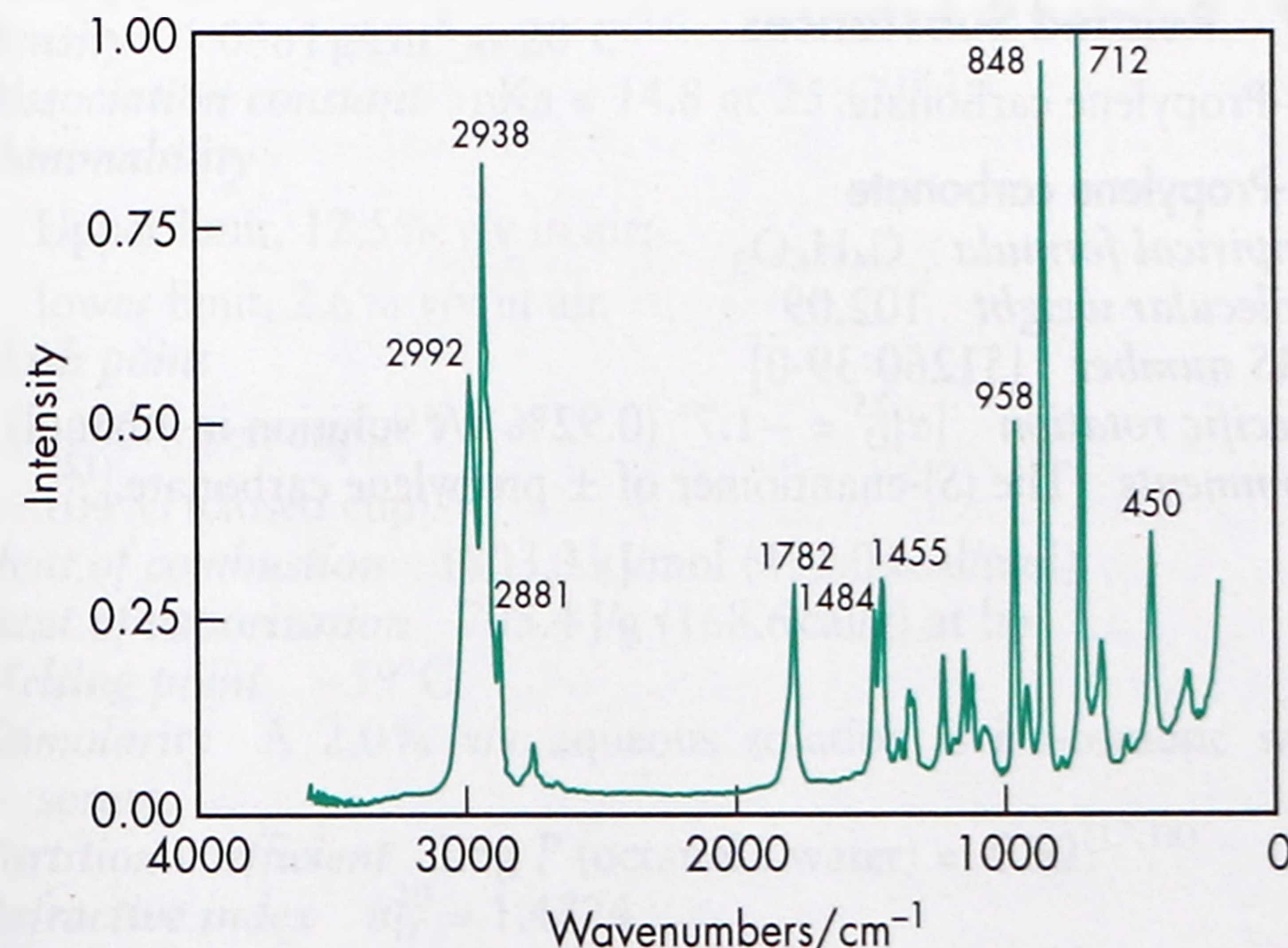


Figure 2: Raman spectrum of propylene carbonate measured in the 180° reflectance mode. Adapted with permission of Informa Healthcare.