



# SZABO SCANDIC

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## Produktinformation



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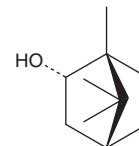
# PRODUCT INFORMATION



## (+)-Borneol

Item No. 23467

**CAS Registry No.:** 464-43-7  
**Formal Name:** (1R,2S,4R)-1,7,7-trimethyl-bicyclo[2.2.1]heptan-2-ol  
**Synonyms:** D-Borneol, (1R)-(+)-Borneol, (+)-endo-Borneol  
**MF:** C<sub>10</sub>H<sub>18</sub>O  
**FW:** 154.3  
**Purity:** ≥95%  
**Supplied as:** A crystalline solid  
**Storage:** -20°C  
**Stability:** ≥2 years



Information represents the product specifications. Batch specific analytical results are provided on each certificate of analysis.

### Laboratory Procedures

(+)-Borneol is supplied as a crystalline solid. A stock solution may be made by dissolving the (+)-borneol in the solvent of choice. (+)-Borneol is soluble in organic solvents such as ethanol, DMSO, and dimethyl formamide (DMF), which should be purged with an inert gas. The solubility of (+)-borneol in ethanol and DMSO is approximately 16 mg/ml and approximately 25 mg/ml in DMF.

(+)-Borneol is sparingly soluble in aqueous buffers. For maximum solubility in aqueous buffers, (+)-borneol should first be dissolved in DMF and then diluted with the aqueous buffer of choice. (+)-Borneol has a solubility of approximately 0.33 mg/ml in a 1:2 solution of DMF:PBS (pH 7.2) using this method. We do not recommend storing the aqueous solution for more than one day.

### Description

(+)-Borneol is a bicyclic monoterpene and a stereoisomer of (-)-borneol (Item No. 23468) that has been found in various plants, including *S. tomentosa*, and has diverse biological activities including analgesic, neuroprotective, antioxidant, and antimicrobial properties.<sup>1-4</sup> (+)-Borneol is a positive allosteric modulator of  $\alpha_1\beta_2\gamma_{2L}$  subunit-containing GABA<sub>A</sub> receptors (EC<sub>50</sub> = 248  $\mu$ M for human recombinant receptors).<sup>1</sup> It dose-dependently increases the paw withdrawal threshold following segmental spinal nerve ligation surgery or intraplantar injection of complete Freund's adjuvant (CFA) in mouse paw.<sup>2</sup> (+)-Borneol (100  $\mu$ M) inhibits increases in reactive oxygen species (ROS) levels and cytotoxicity in SH-SY5Y neuroblastoma cells incubated with amyloid- $\beta$  (1-42) (A $\beta$ 42; Item No. 20574).<sup>3</sup> It also inhibits the growth of Gram-positive and Gram-negative bacteria *in vitro*, including *E. coli*, *S. aureus*, *P. aeruginosa*, *P. vulgaris*, and *S. typhimurium* (MICs = 125-250  $\mu$ g/mL).<sup>4</sup> Formulations containing (+)-borneol have been used as fragrance ingredients.

### References

1. Granger, R.E., Campbell, E.L., and Johnston, G.A.R. (+)- And (-)-borneol: Efficacious positive modulators of GABA action at human recombinant  $\alpha_1\beta_2\gamma_{2L}$  GABA<sub>A</sub> receptors. *Biochem. Pharmacol.* **69(7)**, 1101-1111 (2005).
2. Jiang, J., Shen, Y.Y., Li, J., *et al.* (+)-Borneol alleviates mechanical hyperalgesia in models of chronic inflammatory and neuropathic pain in mice. *Eur. J. Pharmacol.* **757**, 53-58 (2015).
3. Hur, J., Pak, S.C., Koo, B.S., *et al.* Borneol alleviates oxidative stress via upregulation of Nrf2 and Bcl-2 in SH-SY5Y cells. *Pharm. Biol.* **51(1)**, 30-35 (2013).
4. Tabanca, N., Kirimer, N., Demirci, B., *et al.* Composition and antimicrobial activity of the essential oils of *Micromeria cristata* subsp. *phrygia* and the enantiomeric distribution of borneol. *J. Agric. Food Chem.* **49(9)**, 4300-4303 (2001).

#### WARNING

THIS PRODUCT IS FOR RESEARCH ONLY - NOT FOR HUMAN OR VETERINARY DIAGNOSTIC OR THERAPEUTIC USE.

#### SAFETY DATA

This material should be considered hazardous until further information becomes available. Do not ingest, inhale, get in eyes, on skin, or on clothing. Wash thoroughly after handling. Before use, the user must review the complete Safety Data Sheet, which has been sent via email to your institution.

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