Preparation of Polymorphs of Carbamazepine

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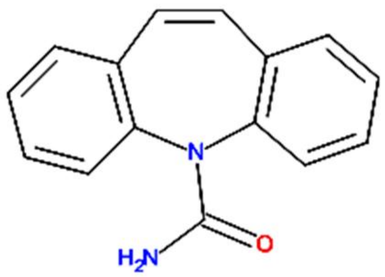
Introduction

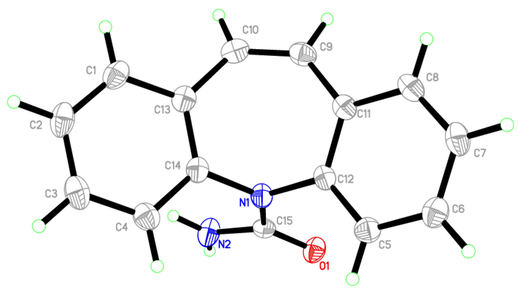
Polymorphism is the ability of a compound to display multiple arrangements of its molecules in a crystal lattice. Polymorphism is an important aspect of the pharmaceutical industry because it allows pharmaceutical companies to avoid patenting issues with other pharmaceutical companies.

Abstract

Carbamazepine is a pain reliever and a treatment for epileptic seizures. Carbamazepine has multiple co-crystal formers as well as multiple polymorphs. In an attempt to crystallize new co-crystal forms and polymorphs, several solutions were prepared. A crystal obtained from one of the solutions was used to determine the crystal structure. The structures were determined using a Bruker SMART X2S X-ray diffractometer at 170 K.



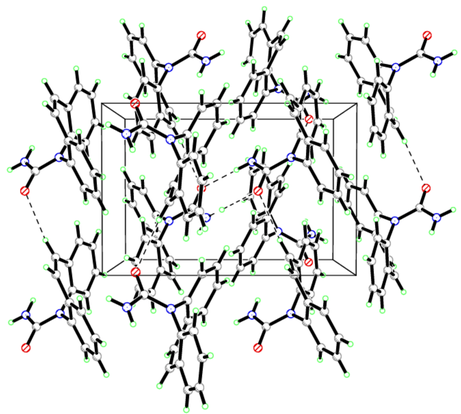
Structure of Carbamazepine



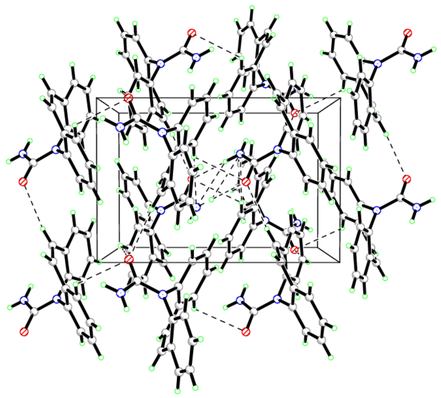
Carbamazepine form 3

Packing Diagrams for Carbamazepine and Methanol

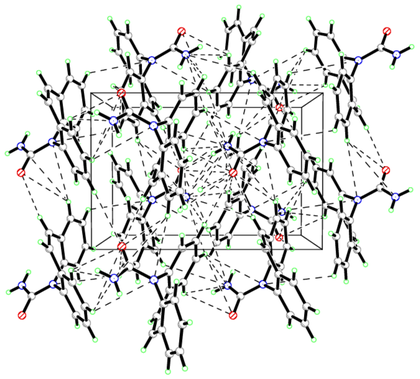
Carbamazepine form 3



Projected down a axis



Projected down b axis



Projected down c axis

Experimental

Single crystals of carbamazepine were obtained by slow evaporation of approximately 50 mg samples dissolved in about 15 ml of ethanol and methanol respectively. The mixtures stood at room temperature for a few days after mixing. The single crystals were then collected from the evaporation mixtures and allowed to air dry for a couple of minutes. The crystals for each form of Carbamazepine were mounted and data was collected at 170K on a Bruker SMART X2S automated diffractometer. Crystal structures were determined by direct methods and refined using the Bruker Apex II software package. The size of the colorless crystal used for data collection was measured as 0.87mm x 0.95mm x 0.97mm.

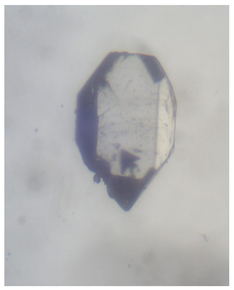


Photo of Carbamazepine and Ethanol

	Carbamazepine
Solvent	Methanol/ Ethanol
Space Group	P 1 2_1/n 1
a (Å) b (Å) c (Å) β˚	7.5379(16) 11.146(2) 13.936(3) 92.891(6)
V (Å^3)	1169.4(4)
Z	4
R (I>4σ(I))	3.94%
S	0.797

Results and Conclusions

1.Carbamazepine forms type 3 crystals when combined with the alcohols of ethanol and methanol.
2. Carbamazepine forms crystals relatively quickly, however the slower the crystal forming process the better the crystal.
3. Future studies will involve growing more polymorphs and possibly co-crystals with Carbamazepine.

Acknowledgements

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