Role of Diastereomeric Solid-Solution Disorders in Limiting Resolution for Spatially Similar Enantiomers: Case Studies using Spiroborate Anions

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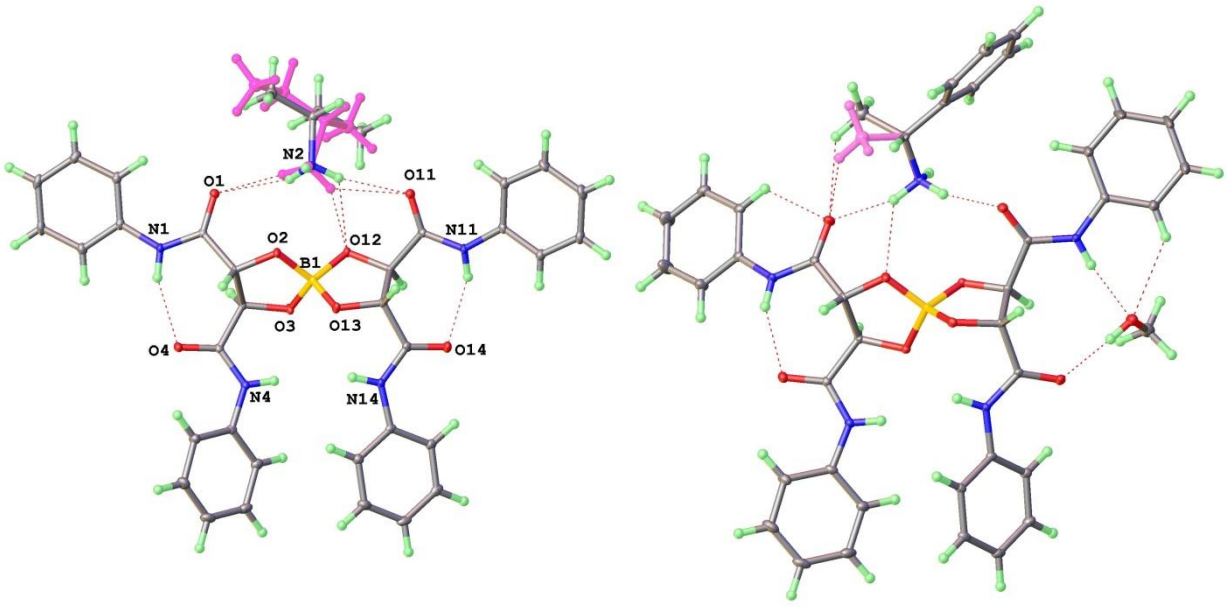
The classical method of resolution through diastereomeric salt formation has long been established. [1] However detailed structure determination of isolated solids is frequently ignored, since the most important issue is the %ee (enantiomeric excess) present in solid (or solution) phase. Recently we described the use of a spiroborate anion [B(Man)$_2$] (Man = mandelate) for the efficient resolution of a variety of chiral cations with %ee in excess of 90% found in the first isolation step.[2] However certain challenging cations for which the spatial overlap between enantiomers is high may not give such excellent %ee although a single phase solid is isolated. This is due to the formation of a diastereomeric solid-solution in which the enantiomeric pair is disordered at the cation site. Study of possible disorder modes is of interest and importance in overcoming this issue. For simple amines with a single chiral carbon possessing C-H group our studies have discovered four distinct disorder modes. Two such disorders are shown for the sec-butylammonium and a-methylbenzylammonium salts of [B(TarNHPh$_2$)$_2$] derived from the diol diphenyltartramide. Using an expanded set of spiroborate resolving anions and crystallization conditions are both important for improving the chances of more optimal resolutions.



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[1] Eliel, E. L.; Wilen, S. H., Mander, L. N. **1994**, Stereochemistry of Organic Compounds; Wiley: N.Y.

[2] Wong L. W-Y.; Kan, J. W-H.; Nguyen, T.; Sung, H. H-Y.; Li, D.; Au-Yeung, A. S-F.; Sharma, R.; Lin, Z.; Williams, I. D. *Chem. Commun*., **2015**, *51*, 15760-15763.