Poster Presentation

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Polymorphic Behaviour of 3-Chloromandelic acid

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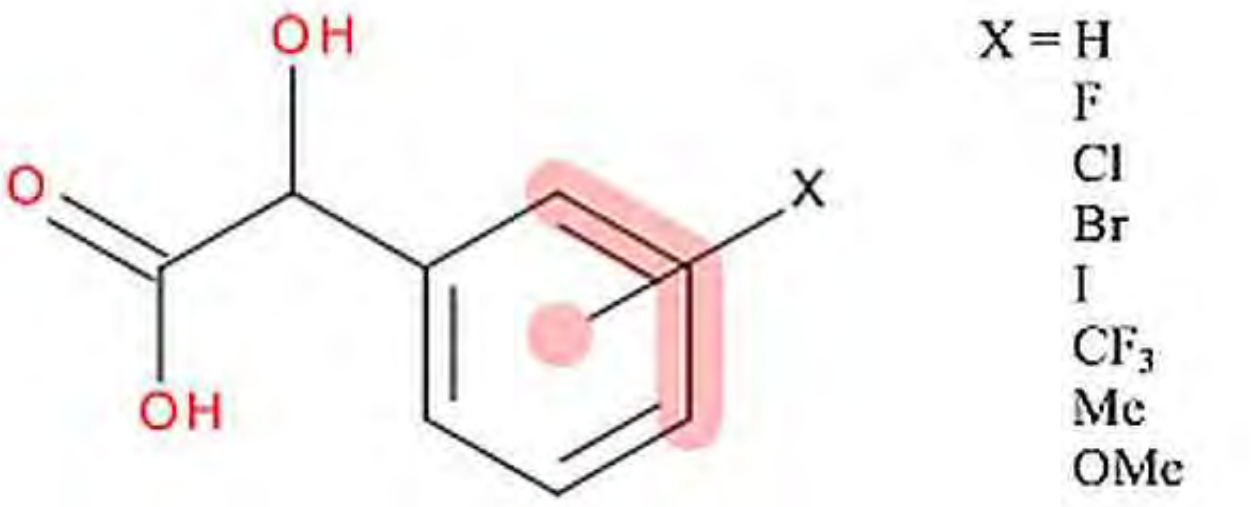
For several years we have been making detailed comparisons of the crystal structures of large sets of related compounds in an attempt to understand the factors determining the adoption of particular molecular arrangements within crystal structures. In all these projects, the XPac program [1] was used to identify similarity between structures in 0-dimensions (0D) (discrete molecular arrangements e.g. dimers, trimers etc),1D (chains or stacks), 2D (sheets or planes) and 3D (frameworks or full isostructurality) as a preliminary to the detailed comparison of the similarities so identified. As part of a larger crystallographic project to investigate the relationship between structure and chirality, we have synthesized and determined crystal structures of families of monosubstituted racemic mandelic acids with fluoro, chloro, bromo, iodo, trifluoromethyl, methyl and methoxy substituents at the ortho, meta and para positions. The substituted mandelic acids are polymorphically prolific and with the inclusion of unsubstituted mandelic acid, 28 structures have been compared. Of special interest has been 3-chloromandelic acid (3-ClMA), for which so far five polymorphs have been discovered: three racemic, two of which are isostructural [2], and two enantiopure. A crystal structure prediction (CSP) study of 3-ClMA has been carried out using the CrystalPredictor [3] and CrystalOptimizer [3] algorithms to generate the crystal energy landscape which is exceptionally dense with 3050 structures within 20 kJ mol-1. Many of these are more stable than the known forms, which is consistent with the complex crystallisation behaviour observed. From our observations of the crystallisation behaviour of substituted chloromandelic acids in general and the CSP study of 3-ClMA, we expect to discover further polymorphs of 3-ClMA and to this end cross-seeding experiments using crystals from differently substituted mandelic acids and a comprehensive polymorph screen are at present being undertaken.

[1] *Gelbrich, T., Hursthouse M. B. (2005), CrystEngComm, 7, 324-336,* ***[2]*** *Coles S. J., Threlfall T. L., Tizzard G. J., submitted for publication (2013),* ***[3]*** *Karamertzanis P. G., Pantelides C. C. (2007) Mol. Phys., 105, 273-291*



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