Evaluating molecular crystal structures with full interaction maps

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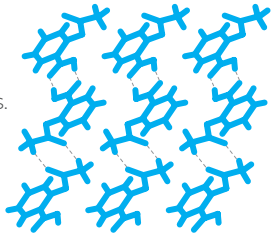
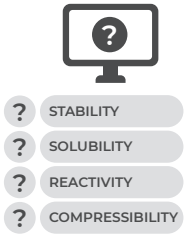
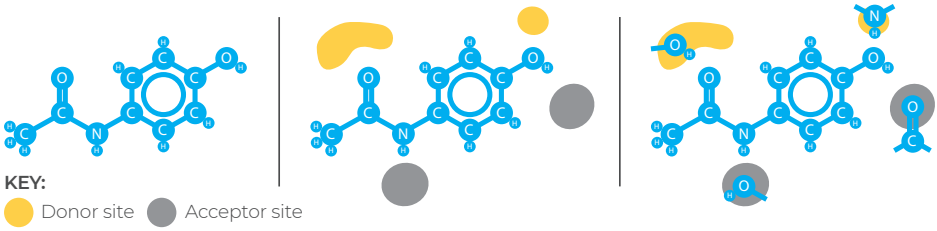
MOLECULAR CRYSTAL STRUCTURES

90% of small molecule drugs are delivered in the crystalline state; crystal structure is also important in several other chemical industries.

A crystalline structure is an array of molecules with regularly repeating interactions. Full interaction maps can be used to evaluate stability and interactions in crystal structures.

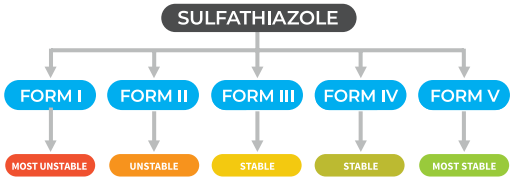






Full interaction maps take seconds to compute, and are generated by identifying active functional groups within molecules. The space around a molecule is then mapped to show the preferred positions of possible interactions with these functional groups. Possible interaction types considered are hydrogen bond donor sites, hydrogen bond acceptor sites, and hydrophobic sites. How well neighbouring molecules satisfy these preferred interactions can then be determined.

Interaction maps can highlight when preferred interactions are not satisfied by contacts from neighbouring molecules in a crystal structure, and help suggest which structures are the most stable. This approach has been shown to be effective in analysing the relative stabilities of drug structural families such as sulfathiazole.



Full interaction maps allow the relative stabilities of molecular crystal structures to be visually evaluated.

Why does this research matter?

Knowing the stability of a compound's crystal form is important, particularly if it's a drug. If a more stable form of a drug emerges, existing products may end up being withdrawn, costing money.

Evaluation of molecular crystal structures using Full Interaction Maps – P A Wood, T S G Olsson, J C Cole, N Feeder, P T A Galek, C R Groom, E Pidcock; *CrystEngComm* 2013, 15, 65–72; DOI: 10.1039/c2ce25849h

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