

Self-dual Tilings and Interpenetrating Periodic Nets

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Some self-dual 3-periodic tilings of ordinary space are described. Pairs of nets carried by these tilings (their 1-skeletons) can interpenetrate so that all the rings of one net are catenated with rings of the other and *vice versa*. For a special class of nets their natural tilings are self-dual and these are called *naturally self-dual* nets.

It is shown that a given net can have an infinite number of distinct self-dual tilings, but (probably) at most one natural self-dual tiling.

Four vertex-transitive naturally self-dual nets are identified and it is conjectured that this list is complete. They are among the minimal nets of Bonneau *et al.* [1]. It is shown these, and closely-related, nets account for the great majority of observed [2] instances of interpenetration in crystal structures.

Some naturally self-dual tilings and their associated nets with more than one kind of vertex are also described and their importance in crystal chemistry indicated.

[1] Bonneau C., Delgado-Friedrichs O., O'Keeffe M., Yaghi O. M., *Acta Crystallogr.*, 2004, **A60**, 517. [2] Blatov V. A., Carlucci L., Ciani G., Proserpio D. M., *CrystEngComm*, 2004, **6**, 377.

Keywords: tilings, periodic nets, interpenetrating nets