REDUCTION OF SYMMETRY IN MIXED CRYSTALS: RELEVANCE TO THE SPONTANEOUS GENERATION OF CHIRALITY ON EARTH

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From the days of Pasteur, when he recognized that organic molecules associated with living matter are chiral, scientists have been puzzled as to the ancestry of homochirality in the living world. The bias for a single handedness in biopolymers from homochiral L-a-amino acids and D-sugars is still regarded as a most remarkable hallmark in Nature.
Recently we proposed a mechanism for the formation of solid solutions of crystals. According this mechanism the formation of mixed crystals is a k'netic process controlled by the structure of the surfaces that delineate the crystal their structure, symmetries and the structure of the guest molecules. The outcome of this mechanism is that the guest molecules occupy specific sites within the host crystal. Consequently, the symmetry of the mixed crystal is lower than that of the pure host. In the case of the racemates it was noticed they may undergo spontaneous resolution within centrosymmetric crystals. We shall illustrate this concept for the separation of racemic amino acids within single crystals of glycine grown at interfaces.
Based on this mechanism a model will be presented for the spontaneous transformation of racemic systems into chiral resolved once, by applying crystallization of glycine at the air/solution interface.