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Crystal Engineering Approach in Physicochemical Properties Modifications of Phytochemicals
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Abstract

Phytochemicals have been used to reduce the risk of diseases and maintain good health and well-being. However, most phytochemicals have a limitation in their physicochemical properties, which can be modified by reforming the shape of the crystals. Therefore, crystal engineering is a promising approach to optimize physicochemical characteristics of the active pharmaceutical ingredients (APIs) in a phytochemical without altering its pharmacological efficacy. Hence, this paper reviews current strategies for the use of crystal engineering to optimize physicochemical properties of phytochemicals, which is followed by the design of the synthesis and characterization of particular phytochemicals, including piperine (PIP), quercetin (QUE), curcumin (CUR), genistein (GEN), and myricetin (MYR). The literature indicates that crystal engineering of multicomponent crystals (MCCs) enhances phytochemical physicochemical properties, including solubility, dissolution rate, stability, and permeability. The MCCs provide a lower lattice energy and noncovalent bonding, which translate into lower melting points and weak intermolecular interactions that generate greater solubility, higher dissolution rate, and better stability of the APIs. Nevertheless, the absence of reported studies of phytochemical crystal engineering leads to a lack of variation in the selection of coformers, methods of preparation, and improvement of physicochemical properties. Therefore, more extensive evaluation of the design and physicochemical characteristics of phytochemicals using MCCs is necessary and manifests the opportunity to enhance the application of phytochemicals in the pharmaceutical industry. © 2022 The Authors.

Author Keywords

Cocrystal; Dissolution Rate; Multicomponent Crystal; Physicochemical Properties; Phytochemical; Solubility

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