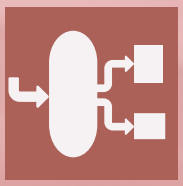

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Section Pharmaceutical Processes

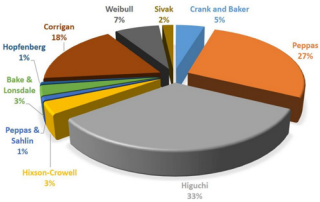
Selected Papers

DOI:10.3390/pr10061094

Drug Carriers: A Review on the Most Used Mathematical Models for Drug Release

Author: Paolo Trucillo

Abstract: Carriers are protective transporters of drugs to target cells, facilitating therapy under each points of view, such as fast healing, reducing infective phenomena, and curing illnesses while avoiding side effects. Over the last 60 years, several scientists have studied drug carrier properties, trying to adapt them to the release environment. Drug/Carrier interaction phenomena have been deeply studied, and the release kinetics have been modeled according to the occurring phenomena involved in the system. It is not easy to define models' advantages and disadvantages, since each of them may fit in a specific situation, considering material interactions, diffusion and erosion phenomena, and, no less important, the behavior of receiving medium. This work represents a critical review on main mathematical models concerning their dependency on physical, chemical, empirical, or semi-empirical variables. A quantitative representation of release profiles has been shown for the most representative models. A final critical comment on the applicability of these models has been presented at the end. A mathematical approach to this topic may help students and researchers approach the wide panorama of models that exist in literature and have been optimized over time. This models list could be of practical inspiration for the development of researchers' own new models or for the application of proper modifications, with the introduction of new variable dependency.



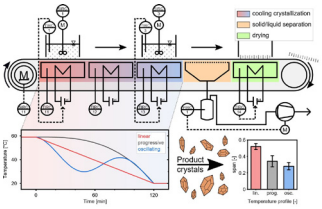
Frequency use distribution of the most famous drug release models.

DOI:10.3390/pr10061047

Cooling Crystallization with Complex Temperature Profiles on a Quasi-Continuous and Modular Plant

Authors: Stefan Höving, Bastian Oldach and Norbert Kockmann

Abstract: Volatile markets and increasing demands for quality and fast availability of specialty chemical products have motivated the rise of small-scale, integrated, and modular continuous processing plants. As a significant unit operation used for product isolation and purification, cooling crystallization is part of this trend. Here, the small-scale and integrated quasi-continuous filter belt crystallizer (QCFBC) combines cooling crystallization, solid-liquid separation, and drying on a single apparatus. This contribution shows the general working principle, different operation modes, and possibilities of temperature control with the modular setup. For precise temperature control in cooling crystallization, Peltier elements show promising results in a systematic study of different operation parameters. Sucrose/water was used as a model substance system. The results confirm that seed crystal properties are the most important parameter in crystallization processes. Additionally, an oscillating temperature profile has a narrowing effect on the crystal size distribution (CSD). The integrated, small-scale, and modular setup of the QCFBC offers high degrees of flexibility, process control, and adaptability to cope with future market demands.



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