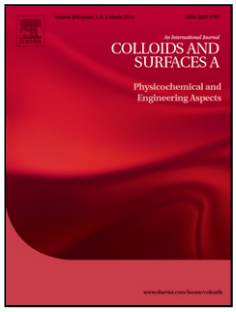

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Spray drying of amorphous ibuprofen nanoparticles for the production of granules with enhanced drug release

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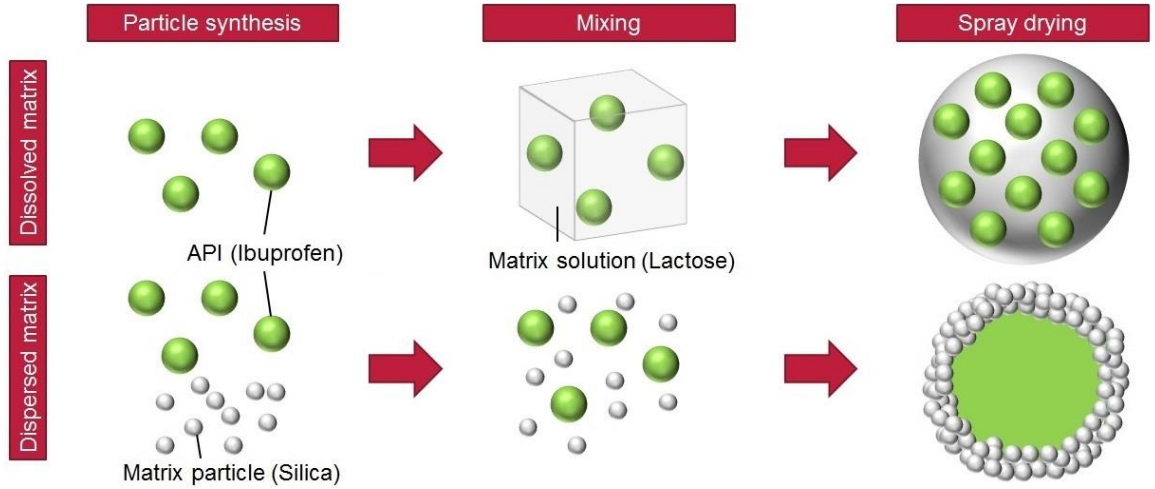
Graphical abstract



Abstract

This work investigates formulation strategies for the production of pharmaceutical powders out of precipitated API (active pharmaceutical ingredient) nanoparticles. In order to accomplish this challenge, composite granules were designed via two distinct formulation strategies with the final goal of producing pharmaceutical powders with enhanced bioavailability. On the one hand, lactose granules were prepared by embedding secluded ibuprofen nanoparticles (particle size of ibuprofen: 100 nm) in a lactose matrix via spray drying. On the other hand, silica granules were obtained by encasing ibuprofen nanoparticles in a nanoparticulate silica shell (primary particle size of silica: 40 nm). Afterwards, granules were analysed by means of dissolution tests with a view to comparing different loading procedures regarding drug release. Furthermore, DSC (differential scanning calorimetry) measurements were used to prove the solid state, amorphous or crystalline, of APIs. Additionally, SEM (scanning electron microscopy) images enabled to characterize the morphology of the granules.

Keywords

Amorphous; ibuprofen; nanoparticles; precipitation; silica; spray drying

1 Introduction

Nowadays the pharmaceutical industry develops a great number of new APIs (active pharmaceutical ingredients) which are poorly water-soluble and tend to show low bioavailability. Consequently, the establishment of suitable galenic methods which increase bioavailability of APIs has become an important issue. One possibility to reach this objective is by converting crystalline APIs into their