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Effect of Twin Screw Granulator Process Parameters on Granule Attributes

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ABSTRACT

Twin screw wet granulation has been considered as an efficient and effective technique of manufacturing granules (agglomerates made up of small particles) and has been widely applied in pharmaceutical industry. However, narrow granule size distributions are difficult to achieve. This study aims to elucidate the effect of process parameters such as liquid feed rate and screw configuration on the granule attributes through granule characterization. The methods used are sieve analysis (for size distribution), liquid distribution (determining the dye concentration in the granules) and density and porosity (percentage gas volume in the granule) analyses. A sieve shaker is used to divide granules into different size ranges in order to have the size distribution data. Liquid distribution analysis can be achieved by taking samples through sonication, centrifugation and measuring the absorbance of supernatant (clear solution after centrifuging) via a UV spectrophotometer. The concentration profile can be calculated utilizing the proper calibration curve. To obtain granule porosity, first absolute density is measured using a helium pycnometer, and then the samples are analyzed in the envelope density analyzer, which calculates percent porosity. The primary results indicate liquid is not distributed uniformly throughout all size ranges and the size distribution plots are bimodal, indicating poor mixing and inefficient and non-uniform breakage. Increasing the liquid feed rate decreases the amount of fines in the granule. Increasing the residence time in the twin screw does not change the granule size distribution but does significantly decrease the granule porosity. These results will help understanding the physics inside the twin screw granulator and facilitate the modeling work.

KEYWORDS

Twin screw granulator, size distribution, liquid distribution, porosity, granulation

REFERENCES

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