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Effect of Conveying and Distributive Mixing Elements on Breakage Phenomenon in Twin Screw Granulation

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ABSTRACT

Twin screw wet granulation (TSG) is gaining more attention and becoming an important process in the pharmaceutical industry. The process is widely implemented because of its flexibility, short residence time, and small equipment footprint. Past studies have shown that screw elements can have a significant impact on the performance of the TSG process. In addition, these studies identified that breakage of wet mass is a significant step in the process. Currently there is no literature that focuses on the effect of each screw element on the breakage process. In this work, experiments have been designed to isolate the breakage process and study the different breakage effects between distributing mixing elements (DMEs) and conveying elements (CEs) in TSG. Cylindrical pellets were made using different model materials having a wide range of dynamic yield strength. The pellets were fed into the twin screw granulator, which then passed through the different screw elements. Pellet breakage probabilities were measured for each screw element configuration. As the strength of the pellets increases, the breakage probability in the CEs decreases. The breakage probability in the DMEs remains the same and shows 100% breakage, independent of the material strength. The experiments have aided in the understanding of the different breakage processes using CEs and DMEs. The breakage in CEs shows a strong dependence on material dynamic yield strength whereas the breakage in DMEs is not a function of the strength.

KEYWORDS

Twin-screw granulation. Dynamic yield strength. Material property.