

Production of Kollidon® 30 particles

Nano Spray Dryer B-90 HP:

Kollidon® 30 as a suitable encapsulant for nano spray drying processes in water and organic solvent

1. Introduction

In order to improve the dissolution property of poorly water-soluble drugs, solid dispersion methods have been used and described in the recent years such as fusion, solvent evaporation or spray drying [1].

Kollidon® 30 is a polyvinylpyrrolidone polymer soluble in water and many organic solvents. It is used as excipient in the pharmaceutical industry for the microencapsulation of drugs. It's mainly applied as a binder for granules and tablets to improve the bioavailability of hardly soluble active compounds or in the field of controlled release [1, 3].

In this study, Kollidon® 30 particles will be produced from aqueous and organic solutions using the Nano Spray-Dryer B-90

The particle size and size distribution appear to increase with mesh size and with the Kollidon® concentration in the sample solution.

The solvents most used in pharmaceutical industries are isopropanol and ethanol. Importantly, the viscosity of alcoholic solution of polyvinylpyrrolidone is reported to be significantly higher than that of aqueous solution [2]. Since viscosities higher than 5 CPs should be avoided in the spray drying process with the Nano Spray Dryer B-90 HP, careful choice of solvents and nebulizer will have to be made.

In summary, in this application study we proved the feasibility to spray dry solutions of polyvinylpyrrolidone using various solvents.

2. Experimental

Kollidon® 30 particles were prepared with the Nano Spray Dryer B-90 HP using the parameters listed in **Error! Reference source not found.**

Table 1 : Process parameters.

Solvent	Water	Isopropanol	Ethanol
Nebulizer	S - L	L	S-L
Gas flow-rate [L/min]	142-152	110	150-152
T Inlet [°C]	100	80	70
T Outlet [°C]	34-53	42	42
Spray rate	80 %	80 %	50-80 %
Frequency [kHz]	125	85	110
Pressure [hPa]	68-72	36	43-62
Feed rate	20 %	3 %	30 %
Kollidon® concentration	2-5 %	2 %	2 %

4. Conclusion

Kollidon® 30 particles from 0.345-7.87 um can be produced with -Nano Spray Dryer B-90 HP using the parameters summarized in the Table 1. Solutions with 2% to 5% Kollidon® 30 could be spray dried with a spray of good quality.

The size and size distribution of the particles were increasing with nozzle diameter and solution concentration. The viscosity of alcoholic solution of polyvinylpyrrolidone is reported to be significantly higher than that of aqueous solution. It is therefore important to keep in mind, that depending on solution concentration, viscosity can influence the spray drying process.

Here reported parameters are recommended as starting values for further process optimization.

References

- [1] L. Xu, S. M. Li, and H. Sunada, "Preparation and Evaluation of Ibuprofen Solid Dispersion Systems with Kollidon® Particles Using a Pulse Combustion Dryer System," *Chem. Pharm. Bull. (Tokyo)*, vol. 55, no. 11, pp. 1545–1550, 2007.
- [2] Bühler, V., 2005. Polyvinylpyrrolidone Excipients for Pharmaceuticals: Povidone, Crospovidone and Copovidone. Springer Science & Business Media.
- [3] BASF, "Kollidon® 30," BASF, 2016. [Online]. Available: <https://industries.basf.com/en/Drug-Formulation/Kollidon®-30.html>. [Accessed: 26-Aug-2016].

3. Results

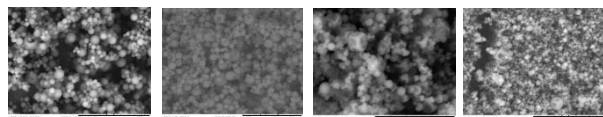


Figure 1 SEM pictures of the dried powder. Left to right: Kollidon® 30 2 % in water with large nebulizer, 5 % in water with large nebulizer, 2 % in isopropanol with large nebulizer, 2 % in ethanol with large nebulizer.

Figure 1 shows the particles obtained using diverse solvents. In water and ethanol, smooth particles were obtained while with isopropanol, the particles were wrinkled.

The mesh diameter and the solution concentration seem to affect the size and the size distribution of the particles.