



STUDY OF THE EFFECT OF THE BINDER CHARACTERISTICS ON THE QUALITY OF THE GRANULES OBTAINED BY THE MELT GRANULATION PROCESS APPLIED TO A PHARMACEUTICAL POWDER MIXTURE

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Résumé

In this work, we present a study of a melt granulation process for capsule filling, applied to a pharmaceutical powder mixture using ibuprofen as the active ingredient and polyethylene glycol (PEG) as the melt binder. The study of melt granulation initially required the design and implementation of an experimental apparatus equipped with the necessary measuring instruments to simulate a high-shear granulator. Once the installation was completed, we explored two methods of binder incorporation: the in situ method and the melt-in method. The tests were conducted under different operating conditions. Additionally, the study focused on evaluating the characteristics of the obtained granules and analyzing the effects of the operating conditions on these characteristics. The properties being assessed included particle size distribution, porosity, flowability, and the dissolution of the active ingredient. In conclusion, this study provides valuable insights into optimizing the conditions for melt granulation in the production of pharmaceutical granules intended for capsule filling.

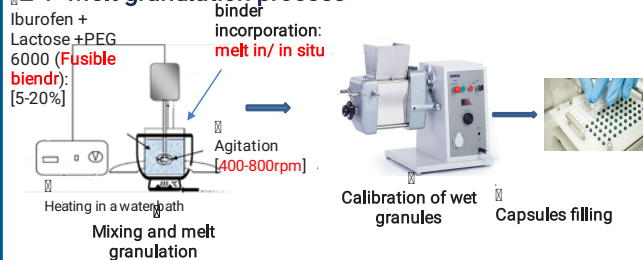
Mots-clés : Melt granulation, ibuprofen, polyethylene glycol, high shear granulator, pharmaceutical formulation.

1-INTRODUCTION

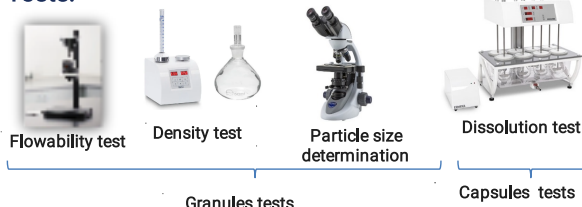
Melt granulation – also known as thermoplastic granulation- involves integrating powdered active pharmaceutical ingredients (APIs) with meltable binders that soften or melt at controlled temperatures between 50 and 90°C. It is used to achieve agglomeration of solid particles in the formulation[1,2].

2-MATERIALS and METHODS

2.1- Melt granulation process



2.2- Tests:



3.1-Particles size distribution results:

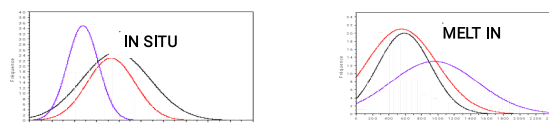


Figure 2 : Particles size distribution at different rotational speed for $C_{moy} = 12.5\%$ for in situ and melt in method

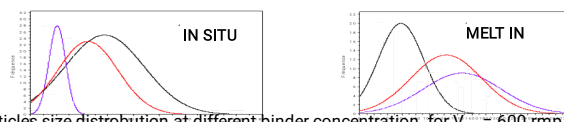


Figure 3 : Particles size distribution at different binder concentration for $V_{moy} = 600$ rpm for in situ and melt in method

3.2- dissolution test results

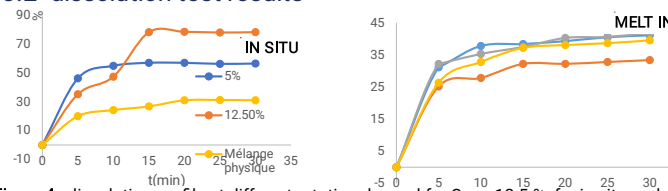


Figure 4 : dissolution profile at different rotational speed for $C_{moy} = 12.5\%$ for in situ and melt in method

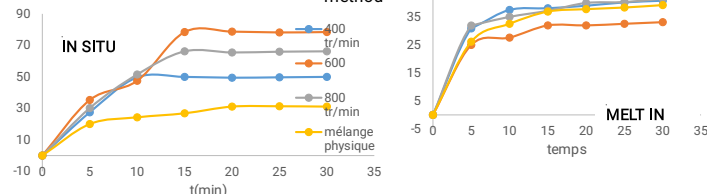


Figure 5 : Dissolution profile at different binder concentration for $V_{moy} = 600$ rpm for in situ and melt in method

3-RESULTS AND DISCUSSION

3.1- Flowability and density tests results:

[PEG 6000]	In situ		Melt in		Rotational speed (rpm)	In situ		Melt in	
	Repos angle	IC	Repos angle	IC		Repos angle	IC	Repos angle	IC
5	30.84	22.64	24.22	23.23	400	28.46	24.89	30.33	26.72
12.5	33.03	25	27.93	26.04	600	33.03	25	27.93	26.04
20	34.09	14.14	32.34	18.24	800	33.37	13.72	31.12	23.03

4-CONCLUSION

From the results obtained, it appears that the in situ method generally offers better results than the melt-in method in terms of dissolution, homogeneity of particle size distribution and flowability. The optimal parameters for the in situ method are 12.5% of binder concentration and a rotational speed of 600 rpm, providing rapid and complete dissolution, homogeneous particle size distribution and good flowability.