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Role of the Surface Free Energy in the Preparation of Granules and in the Selection of a Suitable Device

A. KORBELY, K. PINTYE-HÓDI

Department of Pharmaceutical Technology, University of Szeged, Szeged, Hungary

E-mails: korbely@pharm.u-szeged.hu (A. Korbely), klara.hodi@pharm.u-szeged.hu (K. Pintye-Hódi)

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In the pharmaceutical sciences, interfacial phenomena play an important role in the processing of a wide variety of formulations, such as in the blending of solid materials. The surface energies can be utilized in the formulation of wet granulation processes in order to select a suitable device and to predict the properties of the resulting granules. The success of granulation depends on the spreading of the liquid and/or solid over the solid. In the method of Wu [1], the surface free energy is taken as the sum of dispersive and polar components. The surface free energies of solid materials can be determined by means of contact angle measurements on two liquids with known polarities. If the surface free energies of the solid materials are known, the spreading coefficient may be computed and the interactions between the two materials may be predicted. The spreading coefficient is calculated as the difference between the work of adhesion and the work of cohesion. The spreading coefficient (S_{12}) of a material (1) over the surface of another material (2) can be determined as [2]:

$$S_{12} = 4\left[\frac{\gamma_1^d \gamma_2^d}{\gamma_1^d + \gamma_2^d} + \frac{\gamma_1^p \gamma_2^p}{\gamma_1^p + \gamma_2^p} + \frac{\gamma_1}{2}\right]$$

The purpose of this study was to investigate a device suitable for wet granulation via determination of the spreading coefficient. Contact angle measurements were carried out with an optical contact angle measuring instrument (OCA 20, DataPhysics Instruments GmbH, Filderstadt, Germany). The results were applied to calculate the surface free energy and the spreading coefficient according to the above-mentioned Wu method.

Granules were produced in a high-shear granulator (Pro-C-epT 4M8, Zelzate, Belgium). A lower work of adhesion was found in a steel vessel as compared with a glass process vessel.

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[1] Wu S. Calculation of interfacial tension in polymer systems. J Polym Sci. 1971; 34: 19–30. doi:10.1002/polc.5070340105

[2] Rowe RC. Binder–substrate interactions in granulation: a theoretical approach based on surface free energy and polarity. Int J Pharm. 1989; 52: 149–154. doi:10.1016/0378-5173(89)90289-5