

'philic'-'phobic' plate shaped crystals of aspirin form I

Sneha Sheokand¹, Tanshu Jain¹, Sameer R Modi¹, Bharat Ugale², Ram Naresh Yadav³, C.M. Nagaraja², Navin Kumar³, Arvind Kumar Bansal¹

¹Department Of Pharmaceutics, National Institute Of Pharmaceutical Education And, Mohali, India, ²Department of Chemistry, Indian Institute of Technology (IIT), Ropar, India, ³Department of Mechanical Engineering, Indian Institute of Technology (IIT), Ropar, India

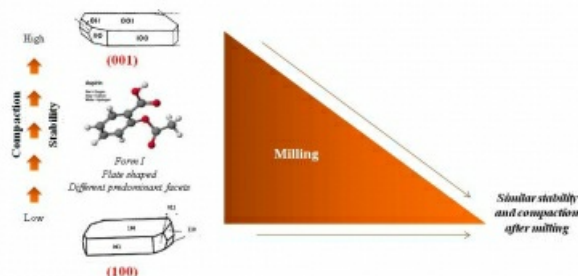
E-mail: snehaniper12@gmail.com

The impact of different solid forms such as polymorphs, pseudo-polymorphs and amorphous forms of a material has been well demonstrated on their physicochemical properties and subsequent product performance. The crystal habits of the same solid form have also received the attention from the scientific community. The present study is a step further and assesses the impact of differential surface anisotropy of two predominant facets on the single crystals of same crystal habit and same solid form of aspirin, on their performance. Hence, this work investigated the effect of hydrophilic (100) and hydrophobic (001) facets of plate shaped, form I, aspirin crystals on their hygroscopicity, stability and compaction behavior. The (100) facet of aspirin exposed polar carbonyl functional groups while (001) facet had non-polar aryl and methyl groups, hence called as 'philic' and 'phobic' crystals, respectively. Additionally, the role of particle size reduction on these properties was assessed, as milling may alter the surface molecular environment. Moisture sorption was investigated using a dynamic vapour sorption analyzer while stability studies were performed at three different conditions (i.e., 40°C/75%RH, 30°C/60%RH and 30°C/90%RH) in open and closed containers. Compactions studies were carried out using a rotary tablet press. Molecular modeling, face indexation and surface free energy determination of both crystals also supported this study. 'philic' (100) crystals adsorbed more moisture than 'phobic' (001) crystals which translated into higher degradation of 'philic' (100) crystals than 'phobic' (001) crystals at all three stability conditions. Both the crystals showed different compactibility despite having same particle size, surface area and hardness value. In contrast, milling reduced the predominance of facets [(100) and (001)] on both the crystals and posed similar degradation and compaction behavior.

[1] Jain, T. et al.(2017), Eur. J. Pharm. Sci. 99, 318-327.

[2] Danesh, A. et al.(2001), Pharm. Res. 18, 299-303.

[3] Heng, J. Y. et al.(2007), J. Pharm. Sci. 96, 2134-2144.



Keywords: [Surface anisotropy, facet, aspirin](#)