Determination of Hansen solubility parameters of binary mixtures of polymers

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With the increasing number of registered drugs and formulation patents, the importance of new ways of drug formulation is increasing. Formulations into amorphous solid dispersions become more popular, due to API stabilization with proper excipient(s). Hot-melt extrusion is a commonly used method for producing amorphous solid solutions or amorphous solid dispersions. The need not only for proper characterization of APIs but also for the characterization of excipients is becoming more important, especially for appropriately selecting the excipient(s) choice for the API at hand.

In the preformulation step, it is typical to select proper excipients based on the knowledge from the previous similar project(s) or based on good experiences with certain polymers. However, this selection method may lead to further formulation issues i.e., degradation of API, unwanted API-excipient(s) reactions, or physical API instability (crystallization) which may lead to a possible patent collision. To avoid this problem, a suitable prediction model based on the proper API and excipients characterization can be used. The Hansen solubility parameters appear to be a promising prediction model for proper excipient selection. Based on the generally well-known basic principle “like dissolves like”, the determination of a suitable excipient(s) for API can make the preformulation process more effective. The majority of the pure polymers are well-characterized. However, the properties and behaviour of mixtures cannot be predicted from data for individually characterized excipients.

This work aimed to study and properly characterize polymers, and their binary mixtures, commonly used as excipients in the pharmaceutical industry. The Hansen solubility parameters of all samples were determined using inverse gas chromatography. The criterion of “likeness” of each polymer was the *Ra* parameter, as the representant of a distance between individual chemical substances in 3D Hansen space. The influence of various sample preparations on

Hansen solubility parameters was studied i.e., binary physical mixtures and mixtures from the hot-melt extrusion process were compared.