PXRD into pre-formulation studies have contributed significantly to early prediction, monitoring and characterization of the active pharmaceutical ingredient incompatibility with pharmaceutical excipients to avoid expensive material wastage and considerably reduce the time required to arrive at an appropriate formulation. Concomitant use of several thermal and spectroscopic techniques allows an in-depth understanding of physical or chemical drug-excipient interactions and aids in selection of the most appropriate excipients in dosage form design. The present review focuses on the techniques for compatibility screening of active pharmaceutical ingredient with their potential merits and demerits. Further, the review highlights the applicability of these techniques using specific drug-excipient compatibility case studies.

Darji, M. A. et al. (2018). "Excipient stability in oral solid dosage forms: A review." *AAPS Pharm Sci Tech* 19(1):12–26.

The choice of excipients constitutes a major part of preformulation and formulation studies during the preparation of pharmaceutical dosage forms. The physical, mechanical, and chemical properties of excipients affect various formulation parameters, such as disintegration, dissolution, and shelf life, and significantly influence the final product. Therefore, several studies have been performed to evaluate the effect of drug-excipient interactions on the overall formulation. This article reviews the information available on the physical and chemical instabilities of excipients and their incompatibilities with the active pharmaceutical ingredient in solid oral dosage forms, during various drug-manufacturing processes. The impact of these interactions on the drug formulation process has been discussed in detail. Examples of various excipients used in solid oral dosage forms have been included to elaborate on different drug-excipient interactions.

Egart, M. et al. (2016). "Application of instrumented nanoindentation in preformulation studies of pharmaceutical active ingredients and excipients." *Acta Pharm* 66(3):303–330.

Nanoindentation allows quantitative determination of a material's response to stress such as elastic and plastic deformation or fracture tendency. Key instruments that have enabled great advances in nanomechanical studies are the instrumented nanoindenter and atomic force microscopy. The versatility of these instruments lies in their capability to measure local mechanical response, in very small volumes and depths, while monitoring time, displacement and force with high accuracy and precision. This review highlights the application of nanoindentation for mechanical characterization of pharmaceutical materials in the preformulation phase (primary investigation of crystalline active ingredients and excipients). With nanoindentation, mechanical response can be assessed with respect to crystal structure. The technique is valuable for mechanical screening of a material at an early development phase in order to predict and better control the processes in which a material is exposed to stress such as milling and compression.

Erxleben, A. (2016). "Application of vibrational spectroscopy to study solid-state transformations of pharmaceuticals." *Curr Pharm Des* 22(32):4883–4911.

Understanding the properties, stability and transformations of the solid-state forms of an active pharmaceutical ingredient (API) in the development pipeline is of crucial importance for process-development, formulation development and FDA approval. Investigation of the polymorphism and polymorphic stability is a routine part of the