Thermal Analysis by Structural Characterization (TASC) as a novel method for assessing heterogeneity in complex solid pharmaceutical dosage forms

Abstract

Characterizing inter- and intra-sample heterogeneity of solid and semi-solid pharmaceutical products is important both for rational design of dosage forms and subsequent quality control during manufacture; however, most pharmaceutical products are multi-component formulations that are challenging in this regard. Thermal analysis, in particular differential scanning calorimetry, is commonly used to obtain structural information such as degree of crystallinity or identifying the presence of a particular polymorph but the results are an averaged over the whole sample, it cannot directly provide information about the spatial distribution of phases. This study demonstrates the use of a new thermo-optical technique, Thermal Analysis by Structural Characterization (TASC), that can provide spatially resolved information on thermal transitions by applying a novel algorithm to images acquired by hot stage microscopy. We determined that TASC can be a low cost relatively rapid method of characterizing heterogeneity and other aspects of structure. In the examples studied it was found that high heating rates enabled screening times of 3-5 minutes per sample. In addition, this study demonstrated the higher sensitivity of TASC for detecting the metastable form of PEG compared to conventional DSC. This

preliminary work suggests TASC will be a worthwhile additional tool for characterizing a broad range of materials.