Cyclodextrin Chemistry: Review of Results by Thermal Analysis

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Cyclodextrins (CDs) are natural or semisynthetic oligosaccharides, which have been used extensively as pharmaceutical excipients. Because of their ability to form inclusion complexes with hydrophobic drug molecules, their main applications have been to enhancing the solubility and dissolution of dugs, but studies have also shown that the stability and bioavailabilty of the guest drugs can sometimes be increased.[1,2,3] In addition, cyclodextrins have been used to prevent drug-drug and drug-excipient interactions and to reduce gastrointestinal and ocular irritation.[2]

The physicochemical properties such as solubility and stability of the guest molecules are modified by the molecular encapsulation of the guest molecule by the cyclodextrin host. The extent of the modification of these properties may be determined by the nature of the inclusion complexation. This highlights the importance of the characterization of the inclusion complexes.

Thermal methods are a popular and rapid qualitative means of investigating the single components (cyclodextrin and drug), their physical mixtures and any inclusion complex formed. The actual formation of an inclusion compound can, however, only really be confirmed after consideration of other analytical approaches namely, phase-solubility analysis, spectral methods and where possible, single-crystal X-ray structure determinations.[4]

The present communication will critically review the above statements in terms of the use of thermal methods in the characterization of inclusion compounds in the solid state.

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The financial support of the OTKA T 026 459 (CsN), the National Research Foundation, Rhodes and James Cook Universities is gratefully acknowledged.