

*Chapter*

## **The Thermal Analysis of Liposomal Formulations as an Element to Evaluate their Effectiveness as Drug and Vaccine Delivery Systems**

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### **ABSTRACT**

Liposomes are colloidal vesicles that are composed of amphiphilic molecules (i.e. phospholipids) and are considered as biocompatible and biodegradable drug and vaccine delivery nanosystems. Several analytical techniques are well established and are currently used for their physicochemical characterization. Because liposomes belong to the thermodynamically unstable dispersed systems, calorimetric analytical techniques and especially the Differential Scanning Calorimetry (DSC) have been applied to indicate whether a given process is spontaneous or not. The structural polymorphism of the liposomal formulations is a well known phenomenon and it has been recognized as a key point of the final product's quality and effectiveness. The aim of this chapter is to present the recent advances of liposomes in drug and vaccine delivery and shed light to the application of DSC to thermodynamic characterization of liposomal delivery platforms. Moreover, examples from the recent literature will be addressed, giving priority to metastable phases and to phase transitions processes.

**Keywords:** Liposomes, Thermal Analysis, Differential Scanning Calorimetry, Thermodynamics, Biophysics, Nonthermodynamics, Nanosimilars

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