DSC study of Taxol loaded polymer nanospheres

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In the past two decades, many works have been dedicated to applying biocompatible and biodegradable polymers in drug delivery systems. Thermoanalytical methods are very useful for polymers analysis and for investigation interactions in polymer-drug systems. In the present work PLGA (poly(D,L-lactic-co-glycolic) acid) polymer nanospheres (NPs) loaded with anticancer drug Taxol with different theoretical loadings were prepared by the modified nanoprecipitation method with size of 200-250 nm in diameter. The PLGA polymer with lactide to glycolide ratio of 85:15 was utilized as a capsulation material due to its biodegradability and biocompatibility. Taxol as an important anticancer drug was chosen for encapsulation to the polymer for its significant role against a wide range of tumours. Iron oxide was incorporated into the polymer nanospheres with the drug to impart them superparamagnetic properties. Thermal properties of the drug loaded non-magnetic and magnetic polymer nanospheres were characterized using differential scanning calorimetry (DSC). It was estimated the solid state solubility of Taxol in PLGA nanospheres, an important parameter that influences the drug encapsulation and release from nanospheres. DSC measurements of non-magnetic and magnetic Taxol loaded NPs with different theoretical drug loadings gave an estimation of loading capacity at approximately 17 mg and 20 mg of Taxol into 100 mg of the used PLGA, respectively. Magnetic properties investigated using SQUID magnetometry showed superparamagnetism of the prepared polymer magnetic nanospheres.