Structure/property correlations in anticancer drug loaded polycaprolactone nanoparticles prepared via double emulsion technique

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In this study, biodegradable polymer polycaprolactone nanoparticles (PCNs) were prepared by a modified Water/Oil/Water (W/O/W) double emulsion-solvent diffusion method using dichloromethane as solvent and polyvinyl alcohol (PVA) as stabilizer. 5-Fluorouracil (5-FU), the anticancer drug, was used for loading into PCNs. Structure, morphology, particles size distribution, optical and thermal properties of drug loaded 5-FU-PCNs were evaluated by different characterization techniques such as X-ray diffraction (XRD), atomic-force microscopy (AFM), optical and transmission electron microscopy (OM and TEM), dynamic light scattering (DLS) and differential scanning calorimetry (DSC) methods. XRD and DSC analysis indicated a molecular level dispersion of drug in the polymer matrix. AFM and TEM data confirmed complicate morphology and spherical shape of the 5-FU-PCNs prepared. The optimized ratios of the different parameters of double emulsion process were founded. Correlations between structural and morphological parameters, preparation conditions (concentration of stabilizer, etc.) and drug encapsulation efficiency (EE%)/drug release from these nanoparticles were evaluated. It can be concluded that the prepared PCNs can be effectively used for preparation of controlled release matrices for anticancer drugs.

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