SUPERCRITICAL CARBON DIOXIDE (CO_2) ASSISTED PREPARATION OF HYDROGEN-BONDED INTERPOLYMER COMPLEXES

By

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ABSTRACT

The use of supercritical CO_2 as medium in polymer processing eliminates many of the disadvantages associated with other means of processing, i.e. high temperatures or toxic solvents. The “soft” processing conditions make CO_2 specifically suitable as medium in the preparation of polymeric drug delivery systems. A unique drug delivery system is based on interpolymer complexation, formed by the association of two polymers via, for instance, hydrogen bonding. Very limited information is available on hydrogen bonding behaviour between polymers in CO_2, or how operating conditions and polymer properties affect such interactions. Drug-loaded polymer complexes prepared in CO_2 have also not yet been investigated. First, the degree of homogeneity and H-bond interaction in blends of poly(ethylene glycol) (PEG) and poly(vinylpyrrolidone) (PVP) prepared in CO_2, ethanol and as physical mixtures were studied. Homogeneity of samples prepared in CO_2 were greater than physically mixed samples, but less than ethanol cast samples. This was attributed to differences in mass-transport properties under the various preparation conditions. The level of PEG-PVP Hbond interaction was higher for ethanol cast blends compared to blends prepared in CO_2. This was attributed to: reduced PEG-PVP H-bond interaction in CO_2 medium and rapidly reduced PEG and PVP chain mobility upon CO_2 venting, delaying rearrangement for optimum interaction.