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Thermodynamic properties of block copolymers of chitosan with poly(D,L-lactide)

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Highlights

- Thermodynamic properties of block copolymers of chitosan with poly(D,L-lactide)
- Heat capacities of block copolymers of chitosan with poly(D,L-lactide) were measured.
- Thermodynamic characteristics of revealed physical transformations were analyzed.
- Standard thermodynamic functions of copolymers were calculated.
- Dependences of thermodynamic properties of copolymers on its composition were given.

ABSTRACT

In the present work, the temperature dependences of heat capacities of block copolymers of chitosan with poly(D,L-lactide) have been measured in the temperature range from 6 to 350 K by precision adiabatic vacuum calorimetry, and thermophysical properties of copolymers have been studied over the range from 270 to 560 K by differential scanning calorimetry (DSC). In the above temperature intervals, the glass transition has been detected for all investigated compounds, and the standard thermodynamic characteristics have been determined and analyzed. The standard thermodynamic functions of block copolymers under study, namely, heat capacity $C_p^o(T)$, enthalpy $[H°(T)-H°(0)]$, entropy $[S°(T)-S°(0)]$, and Gibbs energy $[G°(T)-H°(0)]$ for the range from $T \to 0$ to 350 K, and the standard entropies and Gibbs energies of formation at T = 298.15 K have been calculated based on the obtained experimental data. The standard thermodynamic properties of the investigated compounds have been discussed, and the dependences of thermodynamic properties of block copolymers on their composition have been established.

Keywords: Chitosan; Poly(D,L-lactide); Adiabatic calorimetry; DSC; Heat capacity; Thermodynamic functions.

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