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Phase transitions in bionanocomposites functionalized by nanoparticles

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We investigated the thermal and structural behaviour of the phospholipid 1-stearoyl-2-oleoyl-sn-glycero-3-phosphocholine (SOPC) in the presence of amide-functionalized single-walled carbon nanotubes (af-SWCNTs) using differential scanning calorimetry (DSC) and the surface photo-charge effect (SPCE) 1. Our study focused on the formation of the cooperative unit (CU), which is the basic structural element of the amide-functionalized bionanocomposite across the gel-to-liquid crystal (LC) phase transition, as a function of af-SWCNT concentration. We identified an intermediate state between the gel and LC phases, shaped by steric, van der Waals, and hydrogen bonding interactions. This state was characterized by van't Hoff (VH) enthalpy, reflecting the cooperativity of the phase transition 2. By analyzing the asymmetry of the DSC endothermic peak and comparing calorimetric and VH enthalpies, we quantified the contribution of VH enthalpy to CU formation.

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