In this study, microencapsulated phase change material (PCM) was prepared by complex coacervation method. In the study, n-eicosane which was a linear long chain hydrocarbon was used as PCM and chitosan and sodium alginate polymers were used to form wall of the microcapsules. Nano clay was doped to microcapsule wall structure during microencapsulation process. In the microencapsulation process by complex coacervation method, two oppositely charged polymer solutions were mixed. The pH of the mixture was set to 4 to form the polymer complex structure around the core material emulsified in the mixture. In this study, the mixture solution comprised a chitosan polymer solution of 2.5% (w/v) as polycation solution and a sodium alginate solution of 2.5% (w/v) as polyanion solution. Different from the conventional complex coacervation process, in the study, clay nanoparticles were added in polyanion polymer solutions. Thus, it was aimed that nano particles added in polyanion polymer solution form complex with polycation polymer molecules because of their negative charge. The morphology, chemical structure and thermal properties of the microcapsules were investigated. According to the FT-IR analysis, microencapsulated n-eicosane with chitosan/sodium alginate/nano clay wall was fabricated successfully. DSC analysis results showed that microcapsules containing nano clay in their wall absorbed the latent heat of from 69 J/g to 80 J/g. On the other hand, microcapsules having no nano clay absorbed 68 J/g latent heat. Besides, the increasing amount of the doped nano clay from 1.2 grams to 2 grams, caused to increase the enthalpy values from 69 J/g to 80 J/g as well as melting points of the microcapsules increased. The presence of clay nano particles in the structure of microcapsules was confirmed by energy dispersive X-ray microanalysis (SEM-EDX) and X-ray photoelectron spectroscopy.