In this study, it was aimed to produce latent heat storing polyacrylonitrile nanofiber to be used as solid-solid phase change material. Nowadays, phase change materials, which storage and release large capacity latent heat during their phase change from one physical state to another, have attracted extensive interest. The solid-liquid PCMs have been encapsulated in a shell structure to overcome their some disadvantage such as the leakage, subcooling, low thermal conductivity, reactivity toward the outside environment, and flammability. Recently, the electrospinning technique has been utilized to encapsulate PCMs in a supporting polymer matric in order to produce shape-stable phase change nanofibers (Noyan et al, 2018; Chen et al, 2013). Electrospinning technique can be used to electrospin shape-stable nanofibers form the solid-liquid PCM grafted polymer. In this study, poly acrylonitrile (PAN) nanofibers were produced by a needle electrospinning method. Polyethylene glycol (PEG) polymers with different molecular weight were grafted on PAN nanofibers using glutaraldehyde cross-linker. Thermal properties of the nanofibers such as melting and crystallizing temperatures and enthalpies were investigated by DSC (differential scanning calorimetry) analysis. DSC measurements showed that the enthalpy values of the nanofibers increased with the increase of PEG 1000 or PEG 2000 content. The highest melting enthalpy (\(\Delta H_m\)) and crystallization enthalpy (\(\Delta H_c\)) of the PAN/PEG1000 nanofibers are 57.32 J/g and -67.72 J/g, respectively, while those of the PAN/PEG2000 nanofibers are 127.4 J/g and -125.7 J/g, respectively. The chemical structure of the nanofibers was analyzed using Fourier-transform infrared (FT–IR) spectroscopy. Scanning electron microscope (SEM) analysis was performed to investigate morphology of the nanofibers. The SEM results indicated that the nanofibers were cylindrical and had a smooth external surface.