In this study, production of smart heat insulation materials with heat storage property from textile waste fibers to use in buildings was aimed. For this aim, polyethylene glycol (PEG) polymer (molecular weight = 1000) was applied to the wool fibers in which PEG acts as solid-solid PCM. Two different cross-linkers were used to bind PEG polymer to the fibers chemically. PEG incorporated fibers analyzed by DSC (Differential Scanning Calorimeter), SEM, and FT-IR spectroscopy. Steady state thermal conductivity measurements of the fibers treated with PEG and untreated were carried out. T-history was used to determine thermo-regulating property of the fibers. According to the DSC results, PEG incorporated fibers stored 32,6133 J/g at 30.15°C and 10,4625 J/g at 32.01°C for glutaraldehyde and Arkofix cross-linkers, respectively. T-history results showed that temperature of the box containing PEG1000 incorporated wool fiber was 1-2.5 °C different from that of the box containing untreated wool fiber during 20-25 minutes.