Purpose – The purpose of this paper is to prepare microencapsulated phase change materials (PCMs) and apply them to cotton and wool fabrics for developing thermo-regulating fabrics. Design/methodology/approach – Microencapsulated n-hexadecane and n-octadecane with poly (methylmethacrylate-co-2-hydroxy ethyl methacrylate) shell was prepared. Microcapsules were fabricated using oil-in-water emulsion polymerization method. Their chemical structure, microstructure, thermal energy storage properties and thermal stability were analyzed by Fourier-transform infrared spectroscopy, polarized light microscope, differential scanning calorimeter and thermogravimetric analyzer, respectively. The mean particle size was tested by a particle sized instrument. The microcapsules were applied to the wool and cotton fabrics using pad-dry-cure method. The thermo-regulating property of the fabrics was evaluated using the T-History test. The distribution and durability of the microcapsules on the fabrics was investigated with scanning electron microscopy. Findings – Spherical microcapsules with p(MMA-co-HEMA) shell and n-alkane core have been produced successfully. n-hexadecane in microcapsule solidifies at 14.8-15.6°C with the latent heat of 65.6-129.8 J/g and melts at 16.7-16.9°C with the latent heat of 67.6-136.9 J/g. Microencapsulated n-octadecane solidifies at 25.8-26.3°C with the latent heat of 74.1-106.2 J/g and melts at 26.8-27.4°C with the latent heat of 80.3-113.4 J/g. The microcapsules have enough thermal stability to the temperature of 150°C that was applied during the fixation of microcapsules on the fabric. The thermo-regulating effect of the microcapsule-incorporated fabrics has been proved by the T-history test. Originality/value – PCM microcapsules with p(MMA-co-HEMA) shell and n-hexadecane and n-octadecane core have been produced and their usage to produce thermo-regulating textiles have been proved. To determine the thermo-regulating property of the fabrics treated with these new PCM microcapsules, a T-History system has been designed.