

Analysis of the Ability of Phase Change Material Coated Fabric to Maintain the Required Temperature Range

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Abstract

Phase change materials (PCM) help to regulate the microclimate temperature and body temperature by releasing or absorbing latent heat. This paper focuses on the use of PCM on traditional textiles as well as technical textiles and is the platform to analyse the behaviour and working principle of the phase change material on textiles even though it has been used in other industries. This research has been carried out to analyse ways of maintaining the microclimate temperature for a longer period of time by considering many parameters which influence the maximum performance of PCM. For the purpose of this research, the relative merits and demerits of organic and inorganic PCMs were considered, and organic PCMs were selected. Microcapsules were produced using a chemical method and encapsulated into the fabric using an in situ polymerisation method. Tests were carried out to ascertain the temperature range of phase change and the time to maintain the temperature. The research showed that the molecular weight of the PCM should be reduced to get the temperature close to the body temperature to keep the microclimate temperature at a constant level. The effects on thermal and aesthetic comfort of clothing were also explored as a part of the research.

Keywords: Phase change materials, Encapsulation, Pad-dry-cure method, Polyethylene glycol-1000