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Study of the composition of Coaxial Microfibers with Phase Change Materials under Thermal Analysis

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Asphalt pavements cover a large area of urban centers and are directly related to Urban Heat Islands (UHI). These materials heat up by absorbing a large amount of solar energy and then slowly release it, generating environmental, economic and social impacts that directly harm the well-being of citizens. The use of Phase Change Materials (PCM) in asphalt mixtures is indicated in the literature as an efficient thermoregulation method to mitigate UHI. However, their direct incorporation in asphalt mixtures presents some disadvantages related to modifying the asphalt structure after PCM melting. The development of Coaxial Polymeric Fibers (CPF) emerges as an innovative alternative to incorporate PCM in asphalt mixtures. Thus, the research herein reported aims to produce and select the best composition of coaxial fibers composed of Polyethylene glycol (PEG) as PCM and core and cellulose acetate (Mn: 30,000 and 50,000) as sheath. Thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC) were used for thermal characterization. TGA was used to analyse whether the materials could tolerate the mixing and compaction temperatures of the asphalt mixtures (up to about 200°C) without any mass loss, and DSC to assess the melting point for the CPF. Thereby it is possible to determine the effect of cellulose acetate molecular weight on the phase change temperature of PEG inside the CPF. This information will aid in deciding on suitable materials for asphalt concrete mixtures capable of withstanding asphalt mixing temperatures.