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Thesis Title	<i>Development of coatings with low thermal conductivity with the use of nanotechnology</i>
Supervisor	M. Santamouris, Professor
Summary	<p>The extensive use of materials with unsuitable optical and thermal characteristics in modern cities results in buildings' temperature increase which leads to lack of thermal comfort and greater energy consumption. For this reason there is great interest today in finding new materials that will ensure energy savings and better thermal comfort conditions.</p> <p>The aim of this study is the construction of coatings with low thermal conductivity by adding ceramic or glass hollow microspheres or microspheres containing phase change materials into a common paint. In total, 16 different coating samples were developed and their thermal and optical properties were measured. Then, with the use of EnergyPlus software, simulations were performed for a reference building. For the simulations it was considered that the coatings were applied a) on the interior, b) on the exterior, c) both on the interior and exterior of the building, for depth applications of 3mm and 10mm and for the climatic data of Athens and Warsaw. These simulations resulted in the estimation of the heating and cooling loads as well as the indoors air temperature by means of which the energy savings and the cooling and heating degree hours were calculated.</p> <p>Based on the results of this study, it was concluded that in average the energy saving for the cooling loads is up to 48,4% for Athens and 76,2% for Warsaw, while for heating loads is up to 17,2% and 11,8% respectively. Moreover, a proportional decrease was observed in the cooling degree hours (up to 36,8% for Athens and 74,3% for Warsaw) and in the heating degree hours (up to 11,8% and 8,5% respectively). It should be underlined that the percentages vary depending on the coating, the climatic data, the depth and position of the application.</p>
Key words	Nanotechnology, Coatings, Thermal Conductivity, Energy Savings, Degree hours
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