

Event:  
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**ENERGY in BUILDINGS 2016**  
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#	<b>Magdalini G. Al Fantel</b> MSc. Mechanical Engineer	
Title:	Researcher Engineer at Laboratory of Heterogeneous Mixtures and Combustion Systems at NTUA, Athens, Greece	
Presentation title:	<b>Façade Sun Protection System Enhanced with Phase Change Materials: A Numerical Simulation Study</b>	
<p>Motivated by the ever-increasing energy demand in the building sector, several innovative concepts have been developed, aimed at reducing the energy requirements of a building; among them, systems that exploit the incident solar energy are constantly gaining market share. In this context, a novel façade sun protection system, incorporating Phase Change Materials (PCMs), is investigated. The proposed system consists of a series of dynamically controlled horizontally rotating shading blinds. The system is installed at the external side of the opaque building façade and aims to control the heat exchange between the façade and the environment, reducing unwanted thermal gains and thermal losses. The thermal behaviour and overall energy efficiency of the system are assessed using an in-house developed heat transfer simulation tool, which takes into account both the phase-change process of the PCM, as well as the rotational movement of the blinds. The one-dimensional heat conduction equations are solved using an implicit Backward Euler method and an iterative Gauss-Seidel method; simulation of the PCM's phase change process is achieved by using the effective heat capacity method. The developed simulation tool is validated by comparing the obtained predictions to experimental data available in the literature. The proposed sun protection system is then simulated, aiming to evaluate its efficiency under the climatic conditions of the city of Madrid (Spain) on an annual basis. The rotation of the shading blinds is controlled by applying a predetermined time schedule, thus allowing the system to adapt to the dynamically changing seasonal conditions. Assessment of the obtained results suggests that the investigated sun protection system can contribute significantly to the improvement of the building's overall energy behaviour. In addition, a parametric study is performed to evaluate the effect of the PCM melting temperature (<math>T_m</math>) on the operational characteristics of the system. Results of the parametric study are analysed to determine the PCM melting temperature values that may result in an optimal thermal performance of the proposed system, under given operating and meteorological conditions.</p>		
CV:	<p>Ms Magdalini Al Fantel has graduated from the faculty of Mechanical Engineer at the National Technical University (NTUA) of Athens in 2011. In 2014, she received her Master of Science degree (MSc) in "Energy Production and Management". Since 2011, she has been working as a researcher in Laboratory of Heterogeneous Mixtures and Combustion Systems at NTUA. Her area of expertise is the modeling and the numerical study of the energy performance of the buildings, using simulation tools, such as the official national software of Greece (referred to as TEE-KENAK) and the EnergyPlus. She is participating in the FP7 project "MeeFS: Multifunctional Energy Efficient Façade System for Building Retrofitting" supported by the E.C.</p>	