USE OF DIFFERENTIAL SCANNING CALORIMETRY AND X-RAY DIFFRACTION AS EXPERIMENTAL TOOLS TO UNDERSTAND HOW NUCLEATING AGENT CONCENTRATION AFFECTS SUPERCOOLING IN MICROENCAPSULATED PHASE CHANGE MATERIALS

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ABSTRACT
In this paper, a description and explanation of the experimental techniques used to understand and quantify supercooling will be presented, including differential scanning calorimetry and x-ray diffraction. Differential scanning calorimetry experimental results indicate that supercooling in microencapsulated n-Tetradecane can be suppressed significantly when 4% to 6% of a homologous material is used as nucleating agent. X-ray diffraction experimental results elucidate how nucleating agent concentration affects the morphology of the phase change material after solidification. Both experimental techniques in unison prove to be valuable experimental tools and provide a better understanding of how inclusion of nucleating agents affects the solidification process. Quantitative characterization of microencapsulated n-Tetradecane thermal properties is also presented including latent heat of fusion and melting point data.

INTRODUCTION
In the past decade, microencapsulated phase change materials (MPCM) have been studied and used to enhance the thermal capacity of secondary fluids for air conditioning applications [1-3]. Experiments have shown that phase change materials increase the thermal capacity by providing latent heat of fusion or additional heat capacity at a temperature different from the solidification temperature. Nucleating agents is the most appropriate.

Recently, X-ray diffraction (XRD) has been used to gain a better understanding of how nucleating agents affect the crystal structure of phase change materials during solidification. Fan et al. [4] used XRD in order to obtain the crystallographic system of microencapsulated phase change