Composite material for thermal storage reinforced by aluminium foam skeleton

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ABSTRACT

Solid-liquid transitions have proven to be economically the most attractive for the use of heat storage systems. Phase Change Materials (PCMs) are able to provide extremely high energy storage density and manage to store heat at a constant temperature corresponding to their phase transition temperature. However, PCMs themselves cannot be used as a heat transfer medium. Another heat transfer medium must be therefore employed with a heat exchanger in between to transfer energy from the source to the PCM and from PCM to the load. The technical solution to avoid the low thermal conductivity is described in this contribution. Recently developed advanced heating/cooling aluminium foam ceiling panels are able to distribute homogenously heat to/from interior via a heating/cooling liquid medium. The main benefit of using these panels is that the porous structure created by thermal conductive aluminium pore walls is characterized by pores which are interlinked by microcracks in the pore walls. These open cell structure of aluminium foam with extremely low permeability allows to impregnate porous structure by PCMs and thus to achieve significantly improved thermal conductivity of resulting composite material.

Keywords: aluminium foam, energy efficiency, heat exchangers, heat storage, phase change materials

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BIOGRAPHY

Arun Gopinathan is a PhD student working at the Institute of Materials & Machine Mechanics of Slovak Academy of Sciences in Bratislava (Slovakia) and currently pursuing his doctoral studies from Slovak University of Technology (Slovakia) with dissertation dedicated to the development of aluminium foam composite panels by powder metallurgy which is impregnated with PCM for developing Thermal Energy Storage (TES) system. He is working under the supervision of Dr. Jerz and involved in the project of developing and testing thermally active aluminium foam based roofing systems. His dedicated work involves the investigation of the porous structural aluminium foam in enhancing the heat transfer process and the possibility of its application in the future based TES systems.