Modelling of Phase Transforming Cellular Materials

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ABSTRACT

Phase transforming cellular materials (PXCM) are a new class of materials that can go through high impact deformation and return to their original form. Currently, there are some reliable cellular materials like honey comb that already exists; however, these materials cannot withstand high impact deformation when compared to PXCM. The most advantageous thing about PXCM is that they are not only inexpensive materials, but they are also highly-durable and they absorb and dissipate high amounts of energy. The main concept behind PXCM is that they contain unit cells that have stable configurations. Each stable configuration of the unit cell corresponds to a phase. The transition between these phases are interpreted as phase-transformation of the cellular material. Our approach to this project is to create a simulation tool that will predict the mechanical behavior of a PXCM. The tool will have a GUI interface where users can input the information of the unit cell of the PXCM that they want to model. When the tool is executed, the simulation will present a graph representative of the output. The output displays phases and stable configuration of the material in a force vs displacement graph. The purpose of this interactive tool is to serve as a visual aid for users who want to learn more about PXCM and also create more complex and sophisticated PXCM designs. Successful implementation of this tool will contribute positively in creating design guidelines for a new PXCM with improved energy absorption and dissipation.

KEYWORDS

Phase Transformation, Cellular Materials, Unit cells, Stable configuration.