ABSTRACT

In this paper the behavior of hexagonal honeycombs under dynamic in-plane loading is described. Additionally, the presence and influence of the filler gas inside the honeycomb cells is considered. Such structures are subjected to very large deformation during an impact, where the filler gas might strongly affect their behavior and the capability of deformational energy absorption, especially at very low relative densities. The purpose of this research was therefore to evaluate the influence of filler gas on the macroscopic cellular structure behavior under dynamic uniaxial loading conditions by means of computational simulations. The LS-DYNA code has been used for this purpose, where a fully coupled interaction between the honeycomb structure and the filler gas was simulated. Different relative densities, initial pore pressures and strain rates have been considered. The computational results clearly show the influence of the filler gas on the macroscopic behavior of analyzed honeycomb structures. Because of very large deformation of the cellular structure, the gas inside the cells is also enormously compressed which results in very high gas temperatures and contributes to increased crash energy absorption capability. The evaluated results are valuable for further research considering also the heat transfer in honeycomb structures and for investigations of variation of the base material mechanical properties due to increased gas temperatures under impact loading conditions.