Optimization of auxetic Honeycomb sandwich nanoplates for stiffness enhancement

Usama Hamid and Magd Abdel Wahab

Soete Laboratory, Department of Electrical Energy, Metals, Mechanical Constructions, and Systems, Faculty of Engineering and Architecture, Ghent University, Belgium

Corresponding author: Usama.Hamid@ugent.be

Abstract. Currently, researchers are becoming more interested in sandwich plates with cellular core structures because of their unique characteristics such as ultra-light weight and stiffness. The combination of auxetic honeycomb sandwich structures with nanoplates opens up a wide range of possibilities across various industries, offering improved mechanical properties, but their full potential has not yet been realized. The sandwich plate structures are constituted by an auxetic honeycomb core layer with a negative Poisson's ratio and two skin layers reinforced by graphene nanoplatelets. The high stiffness of these sandwich nanoplates is important for their structural integrity, preventing excessive bending, buckling, or deformation. The geometrical parameters, such as the cell re-entrant angle, beam length, height, and thickness can have different effects on the overall stiffness of these sandwich nanoplates. Optimization techniques on stiffness enhancement of auxetic honeycomb cells can be employed to get optimal geometric parameters while considering the design constraints and the effect of optimized parameters on the stiffness of overall sandwich plates can be investigated.