Nonlinear wave propagation in periodic multilayer of polymers

Wang, Pai, pai@seas.harvard.edu; Casadei, Filippo; Bertoldi, Katia, Harvard University, United States

ABSTRACT

The ultimate goal of this research is to investigate the propagation of large-amplitude elastic waves in periodic multilayer structures. Sources of nonlinearity are associated with large-strain kinematics, material nonlinearity, and bifurcation paths. In this study, we use a numerical approach to investigate the propagation of nonlinear waves of finite deformation in polymeric structures of finite size. Insights on the dispersion properties of such systems, and their functional dependence on the strain levels, are obtained by postprocessing the time-history results obtained through time-domain simulations. In particular, we highlight the nonlinear effects of amplitude parameters on the bandgaps and wave directionality of the considered systems.