

# Non-linear response of soft porous structures: effect of pore shape on their response

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## ABSTRACT

Nature makes extensive use of structures characterized by well defined microstructures - often either regular or periodic - to achieve different properties and attributes. Recently it has been shown that by introducing a microstructure in a soft matrix, microscopic instabilities can be triggered. Interestingly these instabilities can be utilized to design porous materials whose response is characterized by multiple phases with highly varying properties. As an example, a square array of circular pores has been shown to strongly influence the materials stiffness and Poissons ratio. Expanding on these findings, in this study we will investigate both numerically and experimentally the effect of pore shape on the nonlinear response of a square array of holes in a soft matrix. Our results show that the pore shape can be used effectively to design material with desired properties and pave the way for the development of a new class of soft, active and reconfigurable devices over a wide range of length scales.