Driving Mechanisms for Size Dependent Response in Cellular and Foam Like Materials

Ashraf Bastawros
Aerospace Engineering
Iowa State University
Ames, IA 50011-2271

The effective mechanical response of cellular and porous materials strongly depends on the shape and relative size of the test specimen relative to the cell size. We report in this talk about our recent measurements for bending and shear stiffness for several closed cell foams and 2D porous structures (honeycomb). A new testing methodology is developed using magnetic forces to minimize the effect of boundary conditions and end constraint effects. The results signify the effects of the prospective geometry of the specimen and the roll of the boundary conditions. Moreover the experimental results signify the role of macroscopic discontinuities on controlling the relative stiffness of the structure. The results are used to calibrate a micropolar based finite element simulation, whereby a generalized continuum theory can be used in the design of complex structures.

Email:*bastaw@iastate.edu* Ph:515-294-3039