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Title: Scaling of compression strength in disordered solids: metallic foams

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Abstract: The scaling of compression strength with porosity for aluminium foams was investigated. The Al 99.96, AlMg1Si0.6 and AlSi11Mg0.6 foams of various porosity, sample size with and without surface skin were tested in compression. It was observed that the compression strength of aluminium foams scales near the percolation threshold with T-f approximate to 1.9 - 2.0 almost independently on the matrix alloy, sample size and presence of surface skin. The difference of the obtained values of T-f to the theoretical estimate of T-f = 2.64 +/- 0.3 by Arbabi and Sahimi and to Ashby estimate of 1.5 was explained using an analogy with the Daoud and Coniglio approach to the scaling of the free energy of sol-gel transition. It leads to the finding that, there are two different universality classes for the critical exponent T-f: when the stretching forces dominate T-f = f = 2.1, respectively when bending forces prevail T-f = nu.d = 2.64 seems to be valid. Another possibility is the validity of relation T-f <= f which varies only according to the universality class of modulus of elasticity in foam.

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