ON THE GEOMETRY AND COMPRESSIVE STRENGTH OF CERAMIC FOAMS

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1. General

Metal/ceramics interpenetrating composites are new materials obtained by liquid metal infiltration into a ceramic foam, called a preform. Ceramic preforms are produced by a new method of manufacturing of porous ceramics known as gelcasting of foams. Porous ceramics fabricated by this method is characterized by a continuous network of spherical cells interconnected by circular windows. The open porosity due to the presence of windows creates good hydro-dynamical properties for liquid metals infiltration. For better understanding mechanical properties of such composites a numerical model of ceramic foam is needed.

2. Geometry of ceramic foams

Geometry of ceramic foams can be generated in two steps. First, the coordinates of the center point of the spherical bubbles and its diameter are produced by PYTHON scripts. The diameters of spherical bubbles were estimated from micro-tomography and scanning electron microscopy images. On the other hand, the coordinates of the center points are determined in such a way that the bubbles have to intersect with each other. Finally, the intersecting bubbles are subtracted from the bulk block of any shape.

3. Numerical simulations

Several numerical simulations of uni-axial compression test have been performed. The bottom surface of the sample was full constrained and the top surface of this sample was moved parallel to the z- axis. The force was resulted from the final step of displacement in simulation. As a result the effective Young modulus of the investigated foam was determined.

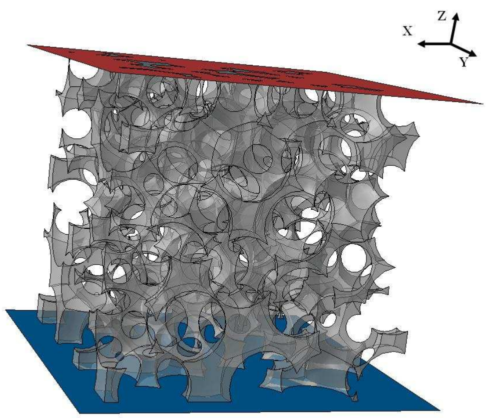

Fig 1. Numerical model of the foam with porosity 90% subjected to compression.

4. References

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