A DEM - FEA methodology for the estimation of the Young´s Modulus of metallic foams obtained by powder metallurgy

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ABSTRACT

This work presents a new methodology that combines both discrete element method (DEM) and finite element analysis (FEA) model for study the Young´s modulus of metallic foams obtained by using the space holder technique. The modelling procedure consists of two stages: i) generation of random particles distribution via DEM, which will be transform on pores considering equivalent diameters obtained experimentally and ii) FEA study of the Young´s modulus. Is very important to note that for foam models the validity of the estimations mostly depends on the proximity of the model to the real foam structure, so phase i) takes care of it. Several types of foams with different porosities ranges were experimentally obtained and characterized in order to validate the procedure. The effect of the porosity on the Young´s Modulus for several foams was estimated using the present methodology, and compared to the experimentally obtained values. Estimations obtained using the new scheme were in excellent agreement with the experimental results, both showing important decreases in the Young´s Modulus as the porosity increases. Results demonstrated the efficacy of the proposed procedure for predicting the mechanical properties of metallic foams.

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