# Plastic Deformation of Nanoporous Aluminium: Molecular Dynamic and Continuum Modelling

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## ABSTRACT

Due to the low density together with the high specific stiffness, the porous materials can absorb large amounts of energy upon deformation and, thus, have attractive mechanical properties. Nanopores can be more suitable in comparison with micropores due to the larger pressure required for their compression and more uniform properties of material on macroscale. Various methods are developed for production of nanoporous metals, including nanoparticle sintering, gas bubbles introduction in melt and others. Foaming of metal by ultrafast laser or electron beam can be an alternative method, which in prospect allows one to reach fuller control on the obtained nanostructure parameters. In this case, the intensive irradiation leads to fast heating of metal, melting and expansion of the formed melt, which gives negative pressure and cavitations [1]. Nucleation and growth of cavities transforms the melt into the foamed state. The foamed aluminum melt retains till the volume fraction of cavities exceeds 0.9 at least [2]. The melt solidification at some intermediate stage of evolution can produces the foamed structure. Plastic deformation regularities of the formed structure are of significant interest for possible applications. In present work, we investigate the plastic deformation of nanoporous aluminium by means of molecular dynamic (MD) simulations and by means of continuum modelling, which uses the plasticity-driven void growth model [3]; we perform comparison between these two approaches. Influence of size and volume fraction of cavities on the stress-strain curves is numerically investigated, as well as the plastic flow localization.

## REFERENCES

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