# Plasticity of printed auxetic lattices

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## Abstract :

*Programming the microstructure variety of artificial materials enables to attain a variety of properties and functions. In the last decades additive manufacturing technologies enabled the creation of (micro-)architectured structures which contollable shapes and geometries (see polymers [1, 3] and metals [2]).*

*The aim of this paper is to explore the creation of complex metallic lattice structures using a direct metal deposition (DLM) laser based technology. Our interest is two-fold : on the one hand side in understanding how materials with a microarchitectured lattice structure will behave when the structures leaves the small strain elastic domain and enters plasticity, buckling and a large strain behaviour and on the other hand side understanding the particular constraints manufactering constraints on the fabricated lattice structures.*

*The lattice structure under scrutiny are obtained using a commercial LMD printer, i.e. Mobile by Beam-Machines, which enables writing of lines in the mm scale. The lattices are obtained by reproducing periodically a classic unit cell to form a panel which are then tested in standard tensile-compression machine and observed using digital image correlation. Our discussion will present several aspects of the problem :(a) influence of the writing parameters, i.e. laser power, deposition speed and the powder flow and the ratio between the of size unit-cell and the writing line on the properties of the structure and the microstructure of its metallic grains.(b) a comparisons between experimental deformation process and numerical predictions trying to focus on the onset of different phenomena such as plasticity, buckling of large strains.*

### Key words : microstructure, plasticity, additive manufacturing

## Références

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