## The influence of the graphite mechanical properties on the constitutive response of ferritic ductile cast iron - A micromechanical FE analysis

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## ABSTRACT

In the present paper a micro-mechanical approach is used to investigate the influence of the graphite mechanical properties on the loading response in the early deformation range of ductile cast iron. A periodic unit cell composed by a single graphite nodule embedded in a uniform ferritic matrix is considered and elasto-plastic behavior of both constituents is assumed; damage evolution in the ductile matrix is taken into account via Lemaitre's isotropic model. Full 3D and 2D plane-stress finite element analyses are performed to simulate the loading conditions experienced by nodules located in the bulk as well as on the material surface. The effects of residual stresses arising during the manufacturing process are also accounted for. It is shown that the constitutive response of the equivalent composite medium can match ductile cast iron only if the graphite Young's modulus value lies within a certain interval, which differs from that reported in previous works on the subject. Experimental support for the numerical results is provided.

## REFERENCES

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