

## **Mechanical improvement of a Co-free high entropy alloy with nitrogen addition**

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Austenitic single phase HEAs from the CoCrFeMnNi family usually present low yield strength values. Among the numerous ways of strengthening the matrix, nitrogen alloying seems to be promising [1]. Moreover, as this element is a strong austenite stabilizer, its presence is an interesting factor for design of new single-phase FCC-structured HEA alloys.

In this study, a Co-free HEA from the Cantor's family was alloyed with nitrogen through nitriding of gas-atomised powders. This process offers an easy way to introduce high amounts of nitrogen inside the particles due to their high surface area. The nitrided powder was then densified by hot isostatic pressing (HIP) procedure to produce a bulk material.

SEM and XRD analysis showed an efficient absorption of nitrogen during the nitriding step, as lattice parameter expands and nitrides are observed. Post HIP heat treatment succeeded in dissolving the nitrides and leaving all the nitrogen in solid solution. Tensile tests and hardness measurements showed that nitrogen improves the mechanical resistance by solid solution hardening, without a significant loss of ductility. Moreover, an increase in the strain hardening of N-containing alloys shows a modification of plasticity mechanisms with enhanced twinning participation to the material deformation.

[1] Traversier, M., Mestre-Rinn, P., Peillon, N., Rigal, E., Boulnat, X., Tancret, F., Dhers, J., Fraczkiewicz, A., 2021. Nitrogen-induced hardening in an austenitic CrFeMnNi high-entropy alloy (HEA). *Materials Science and Engineering: A* 804, 140725. <https://doi.org/10.1016/j.msea.2020.140725>

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