

## **Enhanced uniform elongation in SPD-processed Cu-Fe hybrid materials with helical architecture**

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Pure metals subjected to severe plastic deformation (SPD) demonstrate enhanced strength due to Hall-Petch mechanism and strengthening by increasing dislocation density. However, as a result of low work hardening capacity, SPD-processed metals are characterized by comparably small uniform elongation. Rapid strain localization and necking lead to the decrease of the loading force. Small uniform elongation limits the potential for the additional strengthening that could be realized in case straining would continue homogenously. In this work, we show the possibility to extend the uniform elongation of the SPD-processed UFG copper samples thanks to embedded iron wires with helical architecture. Two helical reinforcement architectures in Cu matrix were realized by using the high pressure torsion extrusion (HPTE) technique. It is demonstrated that a notable extension of the uniform elongation is achieved by the helical geometry of the reinforcements. In this way, the uniform elongation value of the HPTE-processed hybrid samples exceeded 4%.

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