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## Bioinspired Graphene-Copper Matrix Nanocomposites

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**M**etals can be strengthened by adding hard reinforcements, but such strategy usually compromises ductility and toughness. Natural nacre consists of hard and soft phases organized in a regular 'brick-and-mortar' structure and exhibits a superior combination of mechanical strength and toughness,[1] which is an attractive model for strengthening and toughening artificial composites, but such bioinspired metal matrix composite has yet to be made. Here we prepared nacre-like reduced graphene oxide (RGrO) reinforced Cu matrix composite based on a preform impregnation process, by which two-dimensional RGrO was used as 'brick' and inserted into '□-and-mortar' ordered porous Cu preform (the symbol '□' means the absence of 'brick'), followed by compacting.[2] This process realized uniform dispersion and alignment of RGrO in Cu matrix simultaneously. The RGrO-and-Cu artificial nacles exhibited simultaneous enhancement on yield strength and ductility as well as increased modulus, attributed to RGrO strengthening, effective crack deflection and a possible combined failure mode of RGrO. The artificial nacles also showed significantly higher strengthening efficiency than other conventional Cu matrix composites, which might be related to the alignment of RGrO.

### References

[1] Wegst, U.G.K.; Bai, H.; Saiz, E.; Tomisa, A.P.; Ritchie, R.O. Bioinspired Structural Materials. *Nature Mater.* 14 (2015) 23-36.

[2] Xiong, D.B.; Cao, M.; Guo, Q.; Tan, Z.Q.; Fan, G.L.; Li, Z.Q.; Zhang, D. *ACS Nano*, 9 (2015) 6934–6943.