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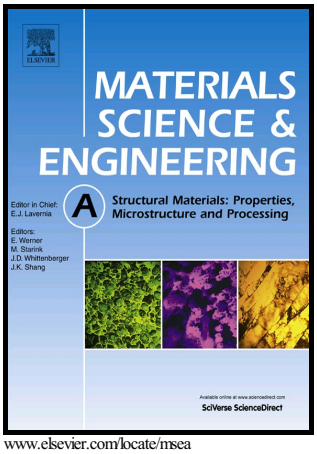

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Copper–graphene bulk composites with homogeneous graphene dispersion and enhanced mechanical properties

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ABSTRACT: Graphene nanosheets have shown great potential in enhancing the strength of metal composites. In previous researches, reduced graphene oxide (rGO) are usually used as the additive. Here, we demonstrate that pristine graphene (PG) prepared by intercalation and exfoliation of graphite over rGO, with negligible oxygen-containing functional groups, much less defects and higher electrical conductivity than rGO, exhibits better performance than rGO as additives for the enhancement of the strength of metal composite. Surface modification of PG and Cu was conducted to enhance the interaction between two components, resulting in homogeneous distribution of PG in Cu matrix. The PG/ Cu composite exhibits yield strength $\sigma_{0.2}$ and 5% compression strength up to 172 and 228 MPa, respectively, which is a 90% and 81% promotion comparing to pure Cu, while its electrical conductivity still stay at 84.2% IACS. As to rGO/Cu composite, yield strength $\sigma_{0.2}$ and 5% compression strength is 156 and 208 MPa, respectively, and its electrical conductivity is 73.4% IASC. Such significant improvement on strength can be explained by the two-dimensional geometry and high crystallinity of PG whose high