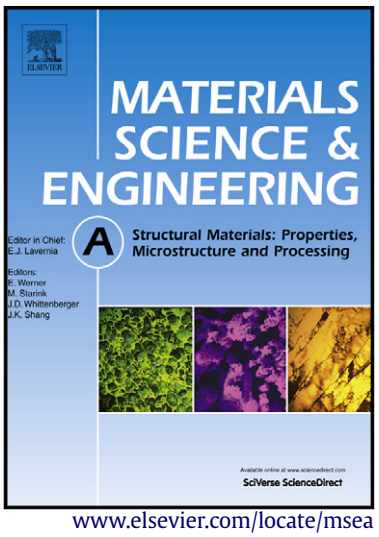

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Abstract: Copper matrix composites strengthened with graphene were prepared by vacuum uniaxial hot pressing of ball milled mixtures of powders. Two grades of graphene platelets were used; one with thickness of 10-20 nm and with lateral size of less than 14 μm and another with much lower thickness of platelets of 2-4 nm and in (002) plane crystallite size below 100 nm. Hot pressing in vacuum allowed obtaining composites containing 1 and 2 wt. % of graphene. The addition of fine graphene led to about 50% higher hardness and about 30% lower electrical resistivity than composite with coarse graphene platelets. SEM studies of samples with fine graphene additions showed much more homogeneous microstructure than those containing coarse graphene. Based on TEM studies, copper particle size was estimated between 100-300 nm, and smaller in the areas of copper particle boundaries, where plastic deformation of copper particles brought about mixing nanocrystalline copper and graphene phases. Graphite conglomerates were identified using electron diffraction and often consisted of elongated platelets of thickness up to 20 nm in both graphene composites studied. Raman spectra confirmed nonhomogeneity of graphene in bulk composites and showed increase of defect density within graphene platelets, as was assessed from low intensity of I(2D)/I(G), equal to 0.12-1.02 compared with 3.5-4, in places of high graphene concentration in both kinds of samples. The weak signal in more homogeneously distributed graphene in samples with fine graphene additions confirmed similar structural features.

Keywords: Metal matrix composites; graphene; powder metallurgy; TEM and SEM electron microscopy; electrical resistivity