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Localized strain induced abnormal growth of cube oriented grain in a graphene nanosheets (GNS) reinforced copper matrix composite

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Graphene nanosheets (GNS) reinforced copper (Cu) matrix composites were fabricated through electrophoretic deposition (EPD) and vacuum hot-pressing sintering process. The bulk texture of the as-sintered pure Cu and the GNS/Cu shows that a strong cube component formed in the GNS/Cu, while the pure Cu sintered with the same method exhibits coarse grains with random orientations. Thereafter, the evolution of microstructure and texture during sintering were characterized by SEM-EBSD and neutron diffraction ex-situ, and the macro and local strain of Cu during the sintering process was investigated in-situ using a dilatometer at high energy synchrotron radiation source at HEMS, DESY. The primary results indicate that the micro strain in the GNS/Cu which contributed by the thermal expansion mismatch between GNS and Cu during sintering can enhance the growth of the cube oriented grains, which finally lead to a strong cube texture inside the GNS/Cu composite.

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