Synthesis of Cu-based Metallic Glass Composites Containing Diamond Particles

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Diamond tools have been widly used in various fields, such as electronic, automotive, construction industries. In order to extend the operating efficiency and life of the tools, wear resistant, corrosion resistant and high strength materials should be used to bind the diamond particles during synthesis. It is because that the selection of metallic binder phase is essential to achieve optimum performance of diamond tools. Recently, Metallic glasses (MGs) have shown superior properties such as high strength, low Young's modulus and high corrosion resistance. Therefore, the use of MG powders as a metallic binder phase of polycrystalline diamond (PCD) provides a new opportunity for practical application of MGs. In the study, we report the synthesis of the PCD/MG composites using spark plasma sintering method. The effect of volume fraction and size of the diamond particles on mechanical properties of the PCD/MG composite has been investigated. The thermal properties associated with the glass transition and crystallization of amorphous phase were measured using differential scanning calorimeter (DSC). X-ray diffractometer (XRD) and scanning electron microscopy (SEM) experiments were performed for structural characterization.