Characteristics of different raw material on the Cu/CNTs nanocomposite fabrication with various experimental conditions using a planetary ball milling with DEM simulation

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In this study, we successful fabrication of composite materials based on copper (Cu) particles and carbon nanotubes (CNTs) using a planetary ball milling (PBM) technique with an optimized condition. Three different samples, namely (i) un-milled copper, (ii) un-milled copper with CNT and (iii) milled Cu with CNTs, have been used and were further processed using the PBM equipment in the presence of additional CNTs. It was confirmed that the characteristics of the final product were improved when the nanocomposite was prepared using the pretreated copper. The results were systematically analyzed using scanning electron microscopy (SEM), X-Ray diffraction (XRD), and field emission scanning electron microscopy (FESEM). After the milling process, the Cu particle and CNTs were completely compacting by applying 1.5 tons of compacting machine at room temperature. In addition to the measurements, the ball motion was simulated using a three-dimensional discrete element method (DEM). The results were analyzed in terms of velocity distribution, impact force, and energy.