Effect of particle sizes on rate sensitivity and dynamic mechanical properties of polypropylene/silica (PP/Sio_2) nanocomposites

Abstract

Filler-related characteristic such as particle size, shape and geometry are essential factors that need to be considered during the evaluation of the material's performance especially in the area of particle filled composites. However, there is limited number of works are reported on this particular issue under high strain rate condition. Based on this concern, the paper presents an experimental results on the effect of particle sizes towards rate sensitivity and dynamic compressive properties of polypropylene/silica nanocomposites across strain rate from 10^{-2} to 10^{-3} s^{-1}. The composite specimens were tested using universal testing machine for static loading and a compression split Hopkinson pressure bar apparatus for dynamic loading. Results show that, the stiffness and strength properties of polypropylene/silica nanocomposites were affected by the size of silica particles. However, the magnitudes of changed are somehow different between micro and nano sizes. On the other hand, particle size also plays a major contribution towards sensitivity of the polypropylene/silica nanocomposites where the smaller the reinforcement sizes, the less sensitive would be the composites. Overall, it is convenience to say that the particle size gives significant contribution towards rate sensitivity and dynamic mechanical properties of polypropylene/silica nanocomposites.