

Mechanical properties of nanosilica/polypropylene composites under dynamic compression loading

Abstract

This article presents results on the dynamic mechanical properties of PP-SiO₂ nanocomposites, with nanosilica contents of 1, 3, and 5% by weight, at various strain rates using a Split Hopkinson Pressure Bar (SHPB) apparatus. The specimens were prepared using a hot compression technique. The dynamic mechanical characteristics, of PP-SiO₂ nanocomposites, are illustrated in terms of stress-strain curves, up to nearly 1100 s⁻¹ of strain rates. From the results, the yield stress, compression modulus, and compressive strength of the composites, were significantly influenced by the strain rates and nanosilica contents. The values of strain rate sensitivity, and dissipation energy of the composites at various strain rates, were also determined. It was found that the strain rate sensitivity, and the dissipation energy, increased with increasing strain rates. In addition, it was observed that the composites experienced more severe damage under a high strain rate loading, compared to a low strain rate loading.