

Measurement on strain rate sensitivity and dynamic mechanical properties of various polymeric materials

Abstract

Strain rate sensitivity and dynamic mechanical properties of polymeric materials are affected to a certain extent especially by the rate of loading. However, there is limited number of works reported on that particular issue. Therefore, the paper presents on static and dynamic mechanical properties of various polymeric materials across strain rate from 10^{-2} to 10^{-3} s⁻¹. The specimen were tested using universal testing machine (UTM) for static loading and a conventional split Hopkinson pressure bar (SHPB) apparatus for dynamic loading. From the results, the compression modulus and compressive strength of all tested specimen increased significantly with increasing strain rates. In addition, positive increment in terms of strain rate sensitivity was recorded for all tested polymers over a wide range of strain rate investigated. Meanwhile, the thermal activation volume has decreased as increasing strain rate. Of the three polymers, polypropylene shows the highest strain rate sensitivity at static region. On the other hand, at dynamic region, polycarbonate shows the highest strain rate sensitivity than that of polypropylene and polyethylene.