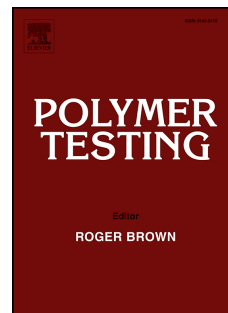


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# New devices to capture the temperature effect under dynamic compression and impact perforation of polymers, application to PMMA

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## Abstract:

In this paper, a Hopkinson pressure bar and a pneumatic ballistic gun, both equipped with a new furnace, are used to conduct dynamic and perforation tests, at high strain rates at temperatures ranging from room temperature to 130°C. To validate this setup, experimental tests were carried out on Poly(Methyl methacrylate) (PMMA), in order to analyze this behavior at high strain rates and temperatures above the glass transition temperature  $T_g$ . Based on experimental data, the transition between brittle and ductile is defined. To estimate it, an analytical approach is reported using the process of thermal activation of the ester molecules group. Moreover, the strain rate sensitivity of the yield stress depending on the initial temperature is modeled using the Richeton's model. The model predictions are in good agreement with the experimental data.

*Keywords: Furnace; Polymers; Dynamic failure; Impact; Compression; PMMA; Cooperative model.*

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