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A split Hopkinson pressure bar technique for measuring the stress relaxation behaviour of polymers on microsecond timescales DAVID WILLIAMSON, University of Cambridge — Stress relaxation experiments are commonly used to probe the time dependent properties of materials such as polymers: a constant strain is applied to the sample and the stress is observed to decay as a function of time. Such measurements are typically performed using quasi-static testing machines with corresponding timescales of minutes to hours. Here we describe a 'dynamic' stress relaxation experiment using a specially configured split Hopkinson pressure bar with a corresponding timescale of microseconds. Conventionally the lengths of the striker-, input- and output-bars of split Hopkinson pressure bar system are contrived such that the end of the loading pulse (strain ramp) denotes the end of the experiment and later time stress-strain information is overwritten by reflected waves within the input and output bars. Here we present a bar configuration which extends the measurement window to include not only the strain ramp but also a subsequent period of near-constant strain during which the stress in polymer samples can relax. The data so obtained can support the development and validation of models which aim to describe the dynamic deformation of polymers.

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