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**Study of sensitivity and repeatability of piezoelectric sensors**

CARYS LLOYD, MARTIN GREENAWAY, WILLIAM PROUD, University of Cambridge — The sensitivity and repeatability of stress measurements obtained using commercially available piezoelectric probes have been studied for impact velocities ranging from  $\sim 2 \text{ m s}^{-1}$  to  $\sim 1600 \text{ m s}^{-1}$ . The probes used were *Dynasen* piezoelectric probes, in which the sensor element is a small ( $(0.4 \pm 0.05) \text{ mm}$  thick,  $(1.2 \pm 0.1) \text{ mm}$  diameter) PZT disc. The probe gives an output voltage  $V(t)$  proportional to the time derivative of the force normal to the z-axis of the PZT. The stress level is obtained using the time-integrated voltage. The research presented focuses on the probe's suitability for a wide range of stress levels and pulse lengths. The pressures measured by the probe are compared directly with theoretically estimated or independently measured pressures for a range of impact velocities. The lowest velocity impact experiments were achieved using a Hopkinson Bar, intermediate velocities were performed using a SIJA (Single Impact Jet Apparatus), and highest velocity impact experiments were achieved using laser-driven aluminum flyers. The experiments found that whilst the probes' pressure measurements were often close to the estimated values, the probes demonstrated a gradual drop in sensitivity for higher velocity impacts.

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