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Dynamic electromechanical behavior of lead zirconate titanate

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ABSTRACT

The direct longitudinal piezoelectric effect in lead zirconate titanate is experimentally investigated under dynamic loading conditions. A modified Kolsky bar (split-Hopkinson pressure bar) is used to generate a uniaxial compressive stress pulse at 103 s^{-1}, tracking the in-situ electrical and mechanical response, as well as damage evolution via high-speed imaging. Results suggest that the domain structure (dipole line-up) can be altered with the application of rapid mechanical loading. These findings are compared with piezoelectric single crystal quartz, which has been shown to exhibit an increased piezoelectric response with damage and polarity switching with the onset of damage under steady applied voltage, in order to explore the intrinsic and extrinsic polarization contributions to the dynamic piezoelectric effect.