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Mechanical Properties of Pentaerythritoltetranitrate (PETN) Single Crystals from nano- indentation: Depth Dependent Response at the Nano Meter Scale[1] MEIYU ZHAI, GREGORY MCKENNA, Texas Tech Univ
— This paper presents the investigation of the mechanical behaviors of the energetic material pentaerythritol tetranitrate (PETN) single crystals using a nanoindentation technique. The indentation tests have been performed on the (110) crystal face, using both spherical and wedge-shaped tips. The load displacement curves along with analysis has been used to extract the mechanical properties and to identify the anisotropic indentation elastic constants for the PETN. The calculated indentation moduli of the PETN single crystal were found to decrease as indentation depth increases and become displacement independent region when the indentation depth is higher 200nm. The indentation modulus obtained from spherical tip indentation is compared with results calculated by using literature values of the anisotropic elastic constants. The wedge indenter tip measurements at various tip orientations are different due to the anisotropy of the PETN. The yield behaviors of the PETN single crystal were also explored using both spherical and wedge tip indentation and differences are discussed. Key Words: PETN, nano-indentation, anisotropic elastic constants, single crystal, plastic yield

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