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Study on Detection Method of Internal Stress in PBX Simulated Material by Laser Ultrasonic Skimming Surface Longitudinal Wave

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Abstract: To verify the feasibility of detecting the internal stress of polymer bonded explosive (PBX) by laser ultrasonic technology, a new and high efficiency nondestructive testing method for internal stress state of PBX simulation material based on laser ultrasonic skimming surface longitudinal wave was established. An experimental platform of on-line laser ultrasonic nondestructive testing used for PBX simulation specimen stress was built. The longitudinal wave signal of laser ultrasonic skimming surface was measured under different loading conditions. Results show that when the PBX simulation specimen is subjected to stresses above 1MPa, the velocity of sound changes obviously when the propagation direction of ultrasonic skimming surface longitudinal wave is parallel to the stress direction. The relation between the relative change quantity of sound velocity and the stress increases approximately linearly. With the increase of stress, the sound velocity of ultrasonic skimming surface longitudinal wave increases. The feasibility of detecting the internal stress state of PBX simulation material by laser ultrasonic skimming surface longitudinal wave is preliminarily verified.

Key words: polymer bonded explosive (PBX); internal stress; nondestructive testing; laser ultrasonic; surface wave; acoustic elasticity

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