

718. 标题: Terahertz Dynamic Scanning Reflectometry of Soldier Personal Protective Material

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摘要: Ballistic characterization of improved materials for Soldier personal protective equipment is an ever-challenging task, requiring precise measurement of materials during ballistic impact. Current dynamic deformation technologies, such as high-speed digital image correlation, and laser velocimetry and vibrometry, are only able to provide surface measurements. However, there is a need to measure the dynamic delamination and mass loss of composite material, allowing calculation of available kinetic energy remaining in the material. A high sensitivity terahertz dynamic scanning reflectometer may be used to measure dynamic surface deformation and delamination characteristics in real-time. A number of crucial parameters can be extracted from the reflectance measurements such as dynamic deformation, propagation velocity, and final relaxation position. As proof of principle, an acrylic plate was struck with a blunt pendulum impactor and dynamic deformation was captured in real-time. Reflectance kinetics was converted to deformation and the velocity was calculated from the kinetics spectrum. Kinetics of a focused pendulum impactor on a steel plate was also acquired, characterizing plate relaxation from maximum deformation to equilibrium with discernible vibrations before reaching stable equilibrium.

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