

DETERMINATION OF MATERIAL STIFFNESS CHANGE BY ULTRASONIC PULSE-ECHO TECHNIQUES DURING THERMAL HEAT FLASH

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ABSTRACT

Nuclear weapons still exist. Therefore, protection against their effects is important. In this paper the focus is on combined thermal and blast effects. Since cold war scenarios, the importance of these effects is increasing, because synthetic material like plastics, carbon fiber or insulation materials are more common. These materials have typically very low thermal conductivity that can lead to a higher temperature stress. Therefore, a thermal heat flash can change the material properties of synthetic materials seriously. A blast will hit this changed environment typically few seconds after the heat flash. This leads to synergistic or combined thermal blast effects. But, the experimental possibilities to investigate combined effects are decreased.

This paper presents an alternative approach to determine combined effects. The idea is that a combination of simultaneously measurements of mechanical and thermal effects during a heat flash exposure offers new advantages. An advantage is that a numerical simulation of a coupled thermal and mechanical interaction could be validated by these measurements.

As an example, the paper will show the determination of material stiffness change by ultrasonic pulse-echo techniques during thermal flash on homogeneous material (e.g. PVC).