A shock tube system for studies of blast injuries and blast mitigations

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Abstract: *In recent decades, improvised explosive devices (IEDs) have been one of the main causes of injuries due to blast effect to military personnel as well as civilians. Such injuries are very complex, with multiple types of injuries happening at once. It is important to be able to re-create the blast waves, isolating their different time-dependent effects (e.g. initial accelerations by shock waves, ballistic impacts, etc.). The shock tube is a versatile apparatus that can generate these elements of blasts in laboratory environment.*

Experiments are performed on an air-driven shock tube system with various types of diaphragms and set-up configurations to control the output. The system is able to produce blasts equivalent to those from detonation of 23 kg TNT at between 3 m to 11 m away from the source. The shock tube allows studies of blast effects on biological samples (e.g. osteoblast and Schwann cell cultures), and blast mitigating properties of different materials and structures (e.g. perforated sheets, granular beds, reticulated foams). Results so far showed an increased mitigation with decreasing open area of perforated sheets, decreased Carman-Kozeny permeability, as well as increasing foam thickness, increasing particle diameter and increasing granular bed length.

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