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Methods of Controlled Shock Wave Generation in A Shock Tube for Biological Applications THUY-TIEN NGUYEN, JAMES WILGEROTH, WARREN MACDONALD, WILLIAM PROUD, Imperial College London, CENTRE FOR BLAST INJURY STUDIES, INSTITUTE OF SHOCK PHYSICS, IMPERIAL COLLEGE LONDON TEAM — The shock tube is a versatile yet simple equipment used in a wide range of scientific research. The diaphragm breakage process, manipulated by different operation methods, is closely linked to the shock wave generated. Experiments were performed on a compressed air-driven shock tube with mylar and aluminium diaphragms of various thicknesses to characterise the output. The evolution of the pressure generated was measured and the diaphragm rupture investigated. Single-diaphragm and double-diaphragm configurations were employed, as were open or closed tube configurations. The arrangement was designed to enable high-speed photography and pressure measurements. Overall, results are highly reproducible, and show that the double-diaphragm system enables a more controllable diaphragm burst pressure. The diaphragm burst pressure was linearly related to its thickness within the range studied. The observed relationship between the diaphragm burst pressure and the generated shock pressure presents a noticeable difference compared to the theoretical ideal gas description. Furthermore, the duration of the primary shock decreased with the volume of the high-pressure charging gas. Computational modelling of the diaphragm breakage process was carried out using the ANSYS software package.

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