2.31 Experiments

A. Experimental Method

In the experiments shock propagation velocities and associated free surface velocities were measured in alpha quartz crystals oriented as X, Y, or Z-cuts.* Shock waves of varying intensity were generated by plane-wave explosive lenses with or without additional explosive pads.

The experimental arrangement is shown schematically in Fig. 2.1. A four-inch diameter explosive lens (and in some cases an explosive pad) was cemented to one surface of a 1/2-inch thick, 5-inch diameter Dural plate. The quartz specimens (usually two) were cemented to the opposite, lapped surface of the plate. The specimens were accurately flat and polished; the tolerance on crystallographic orientation was ± 1°. The faces of the specimens in contact with the plate were vapor-plated with aluminum to yield a reflecting surface. Lucite mirrors, also aluminized on their inside faces were cemented to the outer surfaces of the specimens at angles of 3 to 8°. The edge of the lucite mirror in contact with the specimen was, in each case, set back from the edge of the specimen at least one specimen thickness to avoid interference from edge effects. The X, Y, or Z orientation refers to the smallest linear dimension and also designates the direction of shock propagation. The X-cut crystals were measured in both the + and - orientations because of the large differences observed in electrical experiments (41).

In some of the experiments an inclined lucite mirror was cemented directly to the aluminum plate. Its function was to measure the free-surface velocity of the aluminum to permit impedance-match solutions to the final shocked states (1).

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*Synthetic crystals supplied by Valpey Corporation.

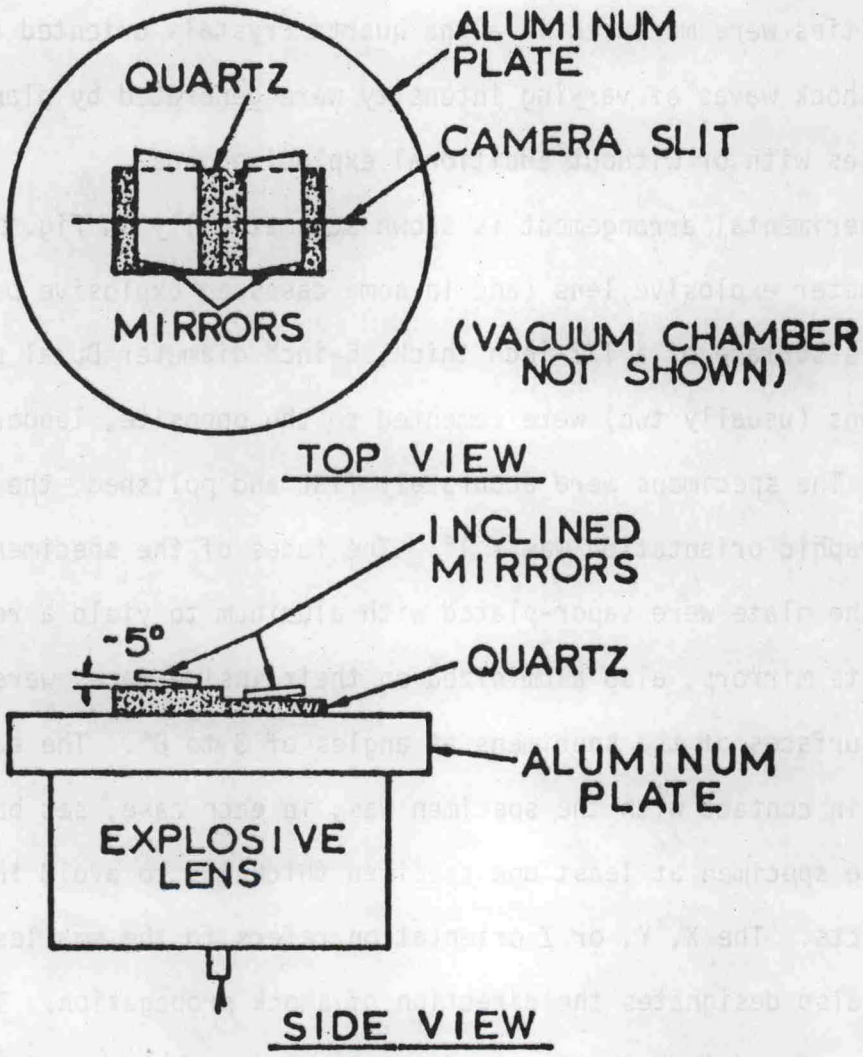

Fig. 2.1 Diagram of experimental assembly