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Equation of State of Argon

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IN a recently published paper[1] it was necessary to present a Hugoniot of argon based on preliminary experimental data. Improved techniques[2] have led to the more precise data shown in Fig. 1.

The experimental measurements were made on gas shocks generated by a metal plate moving into an argon filled chamber. The plates were, within the limits of measurement, instantaneously

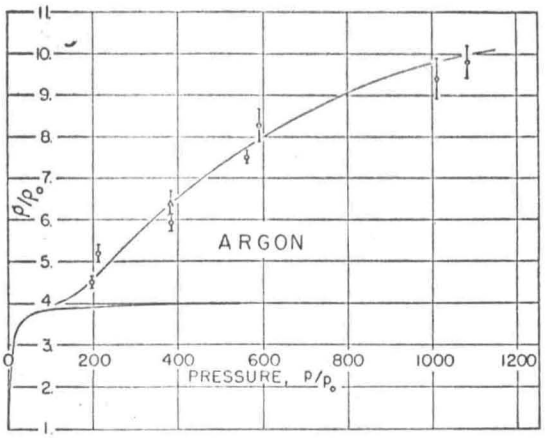

FIG. 1. Hugoniot of Argon (initial conditions, $T_0 = 27°C$, $P_0 = .80 \times 10^6$ dynes/cm²). The point shown by the triangle is for a mixture of 93 percent argon, 7 percent oxygen.

accelerated to a constant velocity which was maintained throughout the interval of investigation. The experimental data consists of measurements of shock and particle velocity. Figure 1 shows the data, transformed through the equations conserving mass and momentum, in the pressure-compression plane.

The data is seen to agree rather well with the upper curve which was calculated by Dr. W. W. Wood[3] using standard methods of quantum statistical mechanics. This calculation assumed no energy to be radiated from the shocked into the unshocked gas. The lower curve in the figure is that calculated for an ideal gas defined by a $\gamma = 5/3$.

The use of this Hugoniot would require changes of minor character only in the cited paper.[1]

It is anticipated that this work will be expounded in a later publication along with similar Hugoniots for other gases.

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[1] R. G. Shreffler and R. H. Christian, J. Appl. Phys. 25, 324 (1954).
[2] Presented at the January, 1954 Meeting of American Physical Society in New York.
[3] Private communication.