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A simple and accurate method for shock wave velocity measurement of initially transparent material based on optical reflection
CHENGJUN LI, QIFENG CHEN, YUNJUN GU, JUN ZHENG, JIANGTAO LI, ZHIGUO LI, Institute of Fluid Physics, China Academy of Engineering Physics — Shock velocity (U_s) is one of the most important parameters in shock wave experiments. So far, there are various methods of U_s measurement for initially transparent sample, such as X-ray radiography, VISAR and the method of recording optical radiance history (ORH). Recently we have developed an improved U_s measurement method by recording the history of reflected optical signal during the propagation of shock wave in the sample, which was sandwiched between two high impedance materials: baseplate and window. Since the reflection signal jumps abruptly at the interfaces of baseplate/sample and sample/window, the propagating time of the shock wave in the sample can be obtained. Hence, U_s is determined with the known thickness of the sample. Applying this method in shock experiments, we have got the U_s for different samples. This optical reflection method is more economic and easier to operate than VISAR and X-ray radiography, and has higher time resolution than ORH. Moreover, the method can also be applied for reflectivity measurement of the sample from initially transparent state to opaque under shock compression.

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