# DYNAMICS OF STRESS WAVE PROPAGATION ALONG CHAINS OF PHOTOELASTIC DISCS IMPACTED BY A PLANAR SHOCK WAVE

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Propagation of stress waves along chains of discs has been studied experimentally and numerically. Optically transparent 20-mm diameter discs, made of epoxy, were loaded by a planar shock wave that normally impacted it. The loading shock wave was generated in a vertical shock tube. The wave propagated downward and hit the chain placed at the bottom of the shock tube. The head-on impact of the incident shock wave and the chain of discs, resulted in a head-on reflection of shock wave inducing behind it a fairly uniform step-wise pressure pulse having a duration of about 6 ms. The recorded fringe patterns of the stress field, in the discs-chain, show that the input pressure pulse was broken into several oscillating cycles. The back and forth bouncing of stress waves gave rise to two different modes of the contact stress oscillations, which continued until the overall stress reached equilibrium with the input conditions. The numerical simulations predict most of the experimental findings. Based on the reasonable agreement obtained between the simulated and recorded stresses in the chain, a parametric study was conduct. Specifically, effects associated with changes in the disc diameter, material density, stiffness/rigidity and the number of discs in the chain on the stressed chain have been studied. It was found that the propagation velocity of the evolved waves increase with improving the contacts between the discs, by exposing the chain to a static load before applying on it's the dynamic load. The wave propagation velocity also increases with increase in the material density of the discs and/or in their diameter. In case of a chain composed of small diameter discs and/or small material density, the transmitted stress wave is first strengthened and only at discs further down the chain it starts to decay. When checking the influence of the dynamic-load duration it was found that long dynamic-load duration dissolves quickly into short pulses. Our fundamental study could shed more light and understanding on the dynamics of propagation of blast waves in granular media.