The Study of the Shock Wave Phenomena in the Soap Film

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ABSTRACT

ABSTRACT The nature of the compressible flows in soap flms is investigated theoretically Three cases are discussed. In the case of steady one-dimensional flows in soapfilms, the basic normal shock relations and Rankine-Hugoniot equations are derived.In the case of oblique waves, the relation is presented. And in the case of of quasi-one-dimensional nozzle flows, the area-velocity relation is found. The results are similar to those of compressible gases. The derivation takes into account the very specific equation of state of these films. The analogy between compressible flow in soap films and in gases is also pointed out. On short time scales, soap films are analogous to compressible gases of specific heat ratio. The role of pressure in gases is played by surface tension in the film and that of compressibilit y by Gibbs or Marangoni elasticity, depending on the time scales of the film stretching. The thickness of the film is an active scalar which resp onds to the dynamics of the film motion in a manner similar to shallow water flows.

Keywords:

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REFERENCES