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Flow behind an exponential cylindrical shock in a rotational axisymmetric mixture of small solid particles of micro size and non-ideal gas with conductive and radiative heat fluxes

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Similarity solutions for the propagation of exponential cylindrical shock wave in a rotational axisymmetric mixture of small solid particles of micro size and non-ideal gas, with conductive and radiative heat fluxes are discussed. The shock wave is driven out by a piston moving with time according to exponential law and the gas is taken to be non-ideal like Wu & Roberts (1993) and Roberts & Wu (1996). The axial and azimuthal components of the fluid velocity in the undisturbed medium are assumed to be varying and obeying exponential laws. The dusty gas is taken to be a mixture of small solid particles of micro size and non-ideal gas, in which solid particles are continuously distributed in the mixture like Pai *et al.* (1980), Miura & Glass (1983). The radiation is considered to be of diffusion type for an optically thick grey gas model and heat conduction is expressed in terms of Fouriers law like Vishwakarma & Nath (2010). The effects of the variation of the mass concentration of solid particles in the mixture, the ratio of the density of solid particles to the initial density of the gas, the heat conductive and radiative heat transfer parameters, and the parameter of the non-idealness of the gas are worked out in detail. It is found that an increase in the ratio of the density of solid particles to the initial density of the gas or the conductive heat transfer parameter or the radiative transfer parameter increases the compressibility of the mixture in the flow field behind the shock front, and hence there is an increase in the shock strength. Also, it is shown that an increase in the parameter of non-idealness of the gas has decaying effect on the shock wave. The potential applications of this study include analysis of data from exploding wire experiments in dusty medium, and cylindrically symmetric hypersonic flow problems associated with meteors or reentry vehicles (c.f. Hutchens (1995)).

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