EULERIAN MODELS FOR THE STUDY OF DUST MOBILISATION AND COMBUSTION PROBLEMS - COMPARISON WITH EXPERIMENTAL RESULTS

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In this work, two Eulerian models for the study of dust mobilisation problems implemented in the IRSN code DUST are studied [1]. The dust combustion model included in the code is also presented. They are a high dilute model and a dense model. These are characterised by a set of conservation equations for the gas and the solid phases, namely mass, momentum, and energy of each phase. In the dense model, the effect of pressure on the solid phase is considered by means of an interaction term. A version of Gidaspow model A [2] is considered. Pressure acting on the solid phase is equal to the gas pressure plus the interaction tensor. In the case of the high dilute model the systems of equations are only coupled by the closure terms. Pressure effect on the solid phase is neglected; the volume fraction of gas is so high that it is not in the gas equations. In both cases, solid phase is assumed incompressible. A brief description of the finite volume method and the numerical schemes implemented, paying special attention to the AUSM family of schemes which has been successfully extended to the solution of problems with high dilute and dense mixtures. A detailed description of these models may be found in [3]. The comparative analysis for the mobilisation case has been carried out considering the experimental results obtained in the IRSN facility called BISE [4]. A small wind tunnel where different samples of Al_2O_3 powder are exposed to different velocities of clean air flow during a period of time. Each sample has particles with a different diameter and concentration.

Regarding the combustion model, a comparison with the combustion tube experiment performed by Chen el al. has been studied [5]. This test consists of a large, horizontal combustion tube containing a mixture of aluminium powder with a mean diameter of 6 μm. The solid phase is modelled as incompressible and air as a perfect gas. A comparison between numerical and experimental results completes this work. Some conclusions are finally drawn.

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