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Modelling of Two-Phase Turbulent Flows in Subsonic Jets with Burning Particles and Phase Transition in Core

Abstract:

The numerical modelling of two-phase flow in subsonic turbulent jets with a mixture of combustible (coke) and non-combustible (magnesite) particles is considered. The following basic processes were taken into account: momentum and heat transfer interaction between phases; ignition and combustion of coke particles; phase transition in particles of magnesite; radiative heat transfer.

Motion of two-phase medium is considered within the framework of stochastic Lagrangian-Eulerian approach, when the model of continual medium is used for the carrier gas, and the disperse phase is described by the trajectory model of trial particles. The influence of the carrier gas turbulence to the particles is considered through the process of their random walk.

On the basis of numerical simulation the conditions of particles ignition, the distribution of particles concentration, and the structure of burning zone have been investigated.

1 INTRODUCTION

A process of jet guniting (making a fire-proof protective coating) of the walls of steel-melting converters allow to increase the number of the steel meltings in several times without the replacement of the converter's base fire-proof walling. This method gives a large commercial profit. A problem of numerical modelling of this process within the framework of technological scheme with coaxial jets is considered in this paper. This technological scheme of the jet guniting is shown in Fig. 1.

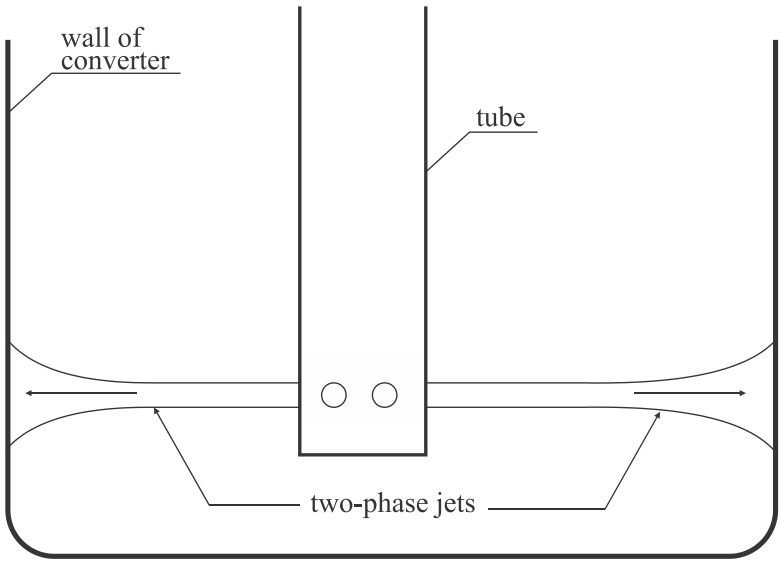

Figure 1. Technological scheme of the jet guniting