Study of internal flow of a bipropellant swirl injector of a rocket engine(Article)

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This work presents the study of the behavior of the internal flow in a swirl bipropellant injector, which is composed of an open-end (without nozzle) and a closed injector (with nozzle). In this way, each of these injectors has a characteristic behavior with respect to velocity distribution, pressure, and other main parameters. In this study, three methods are used, which are: experimental, numerical, and analytical. For the numerical simulation was used a three-dimensional structured mesh, capable of holding three important areas: the oxidizer swirl chamber (closed swirl injector), the fuel swirl chamber (open-end swirl injector), and the area designed for the spray zone, which will include the phenomena caused by the interaction of the flow of the oxidant and the fuel within the bipropellant injector. The simulation was carried out through the commercial code CFD fluent in permanent regime, using the RNG k-epsilon turbulent model and the volume of fluid multiphase model to locate the liquid–gas interface. In addition, experimental data and a mathematical model developed based on theories of Abramovich and Kliachko are also presented. © 2018, The Brazilian Society of Mechanical Sciences and Engineering.

Author keywords

Abramovich theoryBipropellant swirl injectorClosed swirl injectorKlia Kliachko theoryOpen-end swirl injector

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