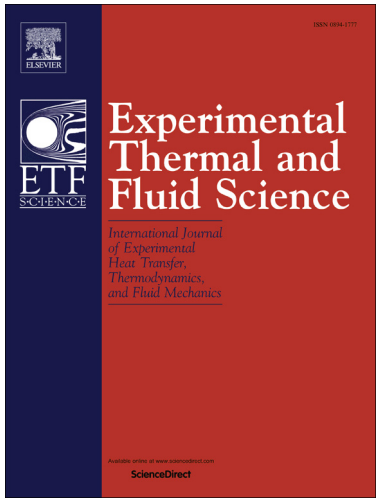

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Study on interaction characteristics between multi gas jets and water during the underwater launching process

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ABSTRACT

To further understand the mechanism of new submerged water piercing gun launcher, the simulation device of an imitated projectile is designed with using multi combustion gas jets to drain off the water in gun tube. The expansion characteristic of multi gas jets and generation mechanism of the gas-curtain in the liquid medium are experimental observed by a high speed camera. The experiment shows that, with the mixing process between the multi combustion gas jets and the liquid medium, the gas-curtain is generated, which provides a gas path for the projectile motion. On the base of experimental observation result, the influences of injection pressure and sprayer structure on projectile motion are discussed. Experiment result indicates: increasing injection pressure, both axial expansion velocities of gas-curtain and projectile moving speed increase; magnifying the center nozzle cannot enhance the drainage performance of the gas-curtain and will restrain projectile motion in the later stage; with enlarging the oblique plane nozzles, the axial velocity of gas-curtain tend to rise after converging and projectile kinematic performance is also improved.

Key words: multi combustion-gas jets; gas-liquid interaction; gas-curtain generation; experimental study; underwater gun launcher

1. Introduction

Kinetic resistance of underwater vehicles can be greatly reduced with the supercavitation technology, which has brought enormous development potentiality for underwater launching [1]. However the two traditional underwater gun launchers, the sealed launcher [2] and submerged launcher [3], have some limitations in practical application. The sealed launcher, which has a higher muzzle velocity, requires a complex muzzle sealing structure. The submerged launcher, of which the launching system is relatively simpler, has a lower muzzle speed. This is because the resistance of underwater moving projectile is almost 800 times of that in the air.