

SPACE PROPULSION SYMPOSIUM (C4)  
Propulsion Technology (3)

Author: Ms. Guo Canlin  
China, guocanlin@126.com

Prof. Jianhua Chen  
Northwestern Polytechnical University, China, 11schenjh@163.com

Prof. Zhang Huiqiang  
China, guocanlin@126.com

Mr. Zhang Guitian  
China, guocanlin@126.com

NUMERICAL SIMULATION OF THE EFFECT OF BAFFLES ON TRACK OF  
KEROSENE-DROPLET**Abstract**

Keyword: liquid Oxygen/ kerosene Rocket Engine, combustion instability, baffle, track of kerosene-droplet, numerical simulation

Abstract: As a kind of conventional devices that control high frequency combustion instability, baffles are widely applied in many thrust chambers of liquid rocket engine. Baffles have two kinds of stability mechanism, one of which is that baffles can destroy the temporal condition of resonance and change the acoustic characteristic of combustion chamber, and the other of which is that baffles can protect the sensitive preignition process and change the flow field in combustion chamber, so baffles can destroy the spatial condition of resonance. To the study of the stability of baffles, the analysis of the effect of baffles on track of kerosene-droplet is important. The numerical models of combustion chamber with and without baffles are established. The two phase cold solutions are simulated with numerical method in liquid rocket engine combustion chamber with and without baffles. To investigate the effect of configuration parameter on track of kerosene-droplet, effects of three kinds of height of baffles and the diameter of droplet on the track of kerosene-droplet are studied. It is proved that baffles destroy the circumfluence arising from injection so the flow field of combustion chamber and the track of kerosene-droplet are regular, and the circumfluence area is very small. However, the effect of baffles on track of kerosene-droplet without combustion is different from actual state, thus the difference between the effects of baffles on track of kerosene-droplet simulated with and without combustion is predicted. Moreover, comparison between conventional baffles, baffles protruded injectors and baffles of longitudinal ribs is presented. Finally, the stability effect of baffles protruded injectors is investigated. By the contrast analysis, the effect of baffles on track of kerosene-droplet is obtained, and the mechanism that baffles control combustion instability is discussed, and the effect of configuration parameter on track of kerosene-droplet is given. The conclusions will help to the designs for baffles and improve the margin of stability, and thus have practical and theoretical value.