MODELING OF VISCOUS COMPRESSIBLE n-BUTANE–OXIDIZER FLOWS IN ENCLOSURE

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Physical and chemical processes during combustion in enclosures are very complex. To understand the relationship between these processes, it is necessary to model all of them simultaneously — the task which looks formidable. A one-dimensional mathematical model of the various phenomena taking place in the enclosure filled with the reactive mixture has been formulated and implemented in the computer code. The model is capable of addressing the phenomena observed in enclosures, namely, multicomponent mixing and heating, forced ignition followed by flame propagation, low-temperature preflame oxidation, heat transfer to vessel walls, as well as formation and propagation of pressure disturbances, shock waves and detonations. Catalytic effects of vessel walls can also be incorporated. The computational code was validated against some interesting test cases dealing with n-butane combustion and nonuniform autoignition in an enclosure.