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Flow Instability in Baffled Channel Flow[1] CHANGWOO KANG, KYUNG-SOO YANG, KYONGJUN LEE, Inha University, Korea — Flow instability of baffled channel flow, where thin baffles are mounted on both channel walls periodically in the direction of the main flow, has been numerically investigated. Flow in a baffled channel is regarded as a simple model for flow in finned heat exchangers, including micro channels. In baffled channel flow, flow characteristics are significantly affected by geometrical configuration of the baffles. Two key parameters were considered, namely baffle interval (L) and Reynolds number (Re) of the main flow. The baffle height is fixed as one quarter of the channel height (H). By using a parametric study, we elucidate dependency of the primary instability, a Hopf bifurcation from steady to a time-periodic flow, on L. It turned out that the most unstable flow is obtained with L/H=3. Transition of two-dimensional (2D) time-periodic flow to three-dimensional (3D) flow is initiated by a secondary instability (SI). Floquet stability analysis was performed to identify the critical Reynolds number of SI for some selected baffle intervals. Several distinct modes were identified, and dependency of SI on L was elucidated. A 3D simulation was finally carried out to confirm the Floquet analysis. The current results shed light on understanding flow characteristics of a finned heat exchanger.

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