Effects of mechanical vibration on Critical Heat Flux in vertical annulus

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Abstract

This study presents the investigation of the vibration effect on CHF. The experiments condition was under atmospheric pressure at vertical heated annulus channel. The experiments for dynamic response of the heater section without vibration excitation were carried out at mass flux of 50 kg/m^2/s and 400 kg/m^2/s. Vibration amplitude was increased at the ONB point during boiling process and the reason of the vibration increase is expected as the results of the flow regime change from subcooled region to bubbly region. CHF experiments with and without mechanical vibration were performed at mass flux of 115 kg/m^2/s and 215 kg/m^2/s. Totally 162 data of CHF with vibration were gained and CHF was increased by mechanical vibration maximum 13.4 % at the mass flux of 115 kg/m^2/s and 16.4 % at the mass flux of 215 kg/m^2/s. The maximum CHF enhancement condition was at 30 Hz vibration frequency and 0.5 mm vibration amplitude. The dominant parameter of vibration which was effective on CHF enhancement was vibration amplitude and the reason of the CHF increase is expected as the increase of the liquid film thickness by increase of deposition of liquid droplet on the film.

Vibration was effective not only heat transfer enhancement but also CHF enhancement. Therefore, FIV could be important parameter in CHF enhancement and must be investigated further more.