

## Experimental Study on the Influence of the downward facing surface characteristics on CHF

Bo Lin<sup>1</sup>, Lei Zhang<sup>1</sup>, Junying Xu<sup>1</sup>, Dongshan Wei<sup>1</sup>, Hanzhe Liang<sup>1</sup>, Xiangyu Yun<sup>1</sup>, and Huiyong Zhang<sup>1</sup>

<sup>1</sup>: China Nuclear Power Research Institute, CGN laboratory of comprehensive thermal-hydraulic and safety, Baolong fourth Road, Longgang District, Shenzhen, Guangdong, PR China  
[lin.bo@cgnpc.com.cn](mailto:lin.bo@cgnpc.com.cn), [zhangleicnpr@cgnp.com.cn](mailto:zhangleicnpr@cgnp.com.cn), [xujunying@cgnpc.com.cn](mailto:xujunying@cgnpc.com.cn),  
[weidongshan@cgnpc.com.cn](mailto:weidongshan@cgnpc.com.cn), [lianghanzhe@cgnpc.com.cn](mailto:lianghanzhe@cgnpc.com.cn), [yunxiangyu@cgnpc.com.cn](mailto:yunxiangyu@cgnpc.com.cn),  
[zhanghuiyong@cgnpc.com.cn](mailto:zhanghuiyong@cgnpc.com.cn)

### Abstract

In the IVR strategy, the thermal load created by the heat generating pool on the inside should be below critical heat flux (CHF) on outside. This paper describes two series of experiments conducted in the mechanism facility which include the effects for CHF on roughness, surface process technology and surface coating. The test about Ra, process technology and surface coating conduct in the pool boiling experiment, and the test about Ra also conduct in the flow boiling. Ra in the CHF effects of Ra test are 0.8 $\mu\text{m}$ , 1.6 $\mu\text{m}$ , 2.4 $\mu\text{m}$ , 3.2 $\mu\text{m}$ , 4.3 $\mu\text{m}$ , 6.3 $\mu\text{m}$ , 9.3 $\mu\text{m}$ . The surface process technology includes pneumatic sandblasting, drawing and electroplate. The nano-fluid and nano-coating are compared to estimate which has larger effect to enhance the CHF. Different roughness also conduct in the flow boiling experiment. The results show that the CHF was gradually enhanced as Ra increasing from 0.08 $\mu\text{m}$  to 2.4 $\mu\text{m}$  under pool boiling condition. The CHF could be enhanced by sandblasting and drawing process, and reduced by electroplate process, based on the smooth plate and the relatively higher CHF was obtained in the sandblasting process test. It shows that Ra roughness is not a independent influence factor on CHF. In the study on the influence of the nano fluid and coating, it is found that the surface deposit of the particles is the key CHF enhancement factor for both tow processes.

**Keywords:** CHF, roughness, process technology, surface coating