OT04

SUPERCRITICAL PSEUDO-BOILING

Attila R. Imre[1,2,3,*], **Gábor Györke**[1], **Axel Groniewsky**[1], **Claire Ramboz**[3]

[1]Budapest University of Technology and Economics, Department of Energy Engineering Muegyetem rkp. 3, H-1111 Budapest, Hungary
[2]Thermohydraulics Department, MTA Centre for Energy Research, P.O. Box 49, Budapest 1525, Hungary
[3]Université d'Orléans, ISTO, UMR 7327, 45071 Orléans, France
[*]imreattila@energia.bme.hu

Abstract

The Widom-region is a special field within the supercritical region, separating the liquid-like and vapour-like sub-regions of the supercritical domain. This region has several peculiarities; some of the properties shown here represent transition between liquid and vapour, while others show extrema, rather resembling to a diffuse liquid/vapour interface that to any bulk fluid phase.

Crossing the Widom-region along an isobar one might experience a smeared transition, resembling to boiling, often called pseudo-boiling. Due to the similarity between boiling and pseudo-boiling, it is often believed that the two phenomena has similar physical background. In our presentation, we would like to show, that the pseudo-boiling is not the supercritical version of normal boiling. In some sense it is rather related to the so-called spinodal anomalies, which usually can be seen in the metastable fluid region (for example in overheated liquid) and connected to the thermodynamical stability of the fluids.

The connection between pseudo-boiling and spinodal anomalies can give us a an opportunity to explain the temperature limit of the underwater hydrothermal wells, called "black smokers", emitting hot subcritical and more rarely supercritical water (depending on the depth of the oceanic floor and also on the intensity of volcanic activity).