BOILING HEAT TRANSFER ENHANCEMENT BY NANO-PARTICLES-ASSEMBLED BI-POROUS LAYERS

Kazuhisa Yuki, Tokyo University of Science-Yamaguchi
kyuki@rs.tus.ac.jp
Yuki Kuroda, Tokyo University of Science-Yamaguchi
Koichi Suzuki, Tokyo University of Science-Yamaguchi

Key Words: Bi- porous layer, High heat flux, Boiling heat transfer, Saturated pool boiling

Nanoparticles-assembled bi-porous structure is newly proposed as boiling heat transfer enhancement technique. In order to assemble nanoparticles onto a heat transfer surface as a thin layer, a boiling adhesion method (BAM) is originally introduced in which, water or water/ethanol solution with mono-dispersed nanoparticles is dropped or sprayed onto a high temperature surface, and then the nanoparticles deposit onto the heat transfer surface during the boiling. In addition to that, it is expected that boiling bubbles can produce micro or milli scale of larger pores at the same time, which enables to fabricate bi-porous structure.

In order to evaluate the boiling heat transfer performance of the bi-porous surface, the boiling curve is obtained under atmospheric and pool boiling conditions. The nanoparticles we used are aluminum oxide ones with the average diameter of 31 nm. The experimental results show that the boiling adhesion method can produce multi-scale pore structures composed of nano-scale pores and micro-scale pores and that the bi-porous layer can enhance the critical heat flux.