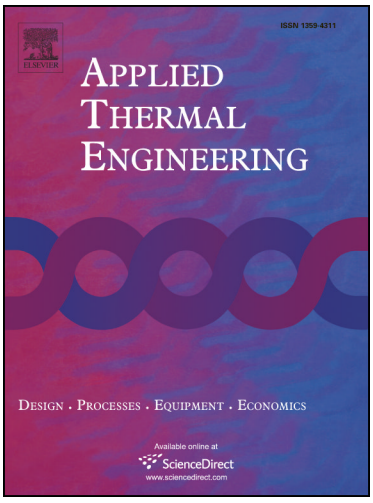


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# Pool boiling investigation on gradient metal foams with double layers

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**Highlights:**

1. Gradient metal foams' pool boiling is experimentally studied.
2. Adding nanoparticles deeply influence surfactant contact angle.
3. Nanoparticle and bubble growth affects fiber temperature.
4. Surfactant heavily changes GMF pool boiling heat transfer.

**Abstract**

Fiber temperature, bubble growth and boiling curves for gradient metal foams (GMFs) with double layers have been experimentally investigated during pool boiling under atmospheric pressure in deionized water, surfactant solutions and surfactant-nanoliquids. The surfactants are Triton X-100 (TX-100) and polyvinyl pyrrolidone (PVP). The surfactant-nanoliquids are prepared by adding alumina nanoparticles into TX-100 or PVP solutions. GMFs are made by uniform copper foam and nickel foam. The pore densities are 20 PPI and 5PPI. The porosity is fixed as 0.98. The results show that PVP worsens GMF pool boiling heat transfer in most experimental heat flux region while TX-100 improves it in a certain heat flux region. Adding 10 nm alumina nanoparticles into TX-100 solutions increases the static contact angle on copper and nickel surfaces, while adding 10 nm alumina nanoparticles into PVP solutions decreases the static contact angle. Fiber temperature is affected by bubble growth and heat flux. Neither TX-100 nor PVP alumina-particle nanoliquid improves GMF pool boiling heat transfer.

**Key words:** Gradient metal foam; Fiber temperature; Bubble growth; Contact angle; Surfactant-nanoliquid