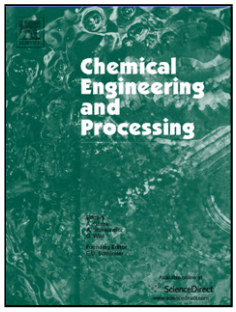

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Enhancement of nucleate boiling heat transfer using structured surfaces

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Research highlights

- Nucleate pool boiling heat transfer of structured surfaces are studied
- Two different pool liquids such as water and isopropyl alcohol are used as test fluid
- Tests are carried for heat flux input in the range of 0-300 kW/m^2 for water
- Structured surface exhibits 200 % higher enhancement in heat transfer coefficient

Abstract: *In the present study, an experimental investigation has been carried out to investigate the nucleate boiling heat transfer performance of various orthogonally intersecting tunnel structured surfaces. Tests were carried at atmospheric pressure and saturated pool boiling conditions by using water and isopropyl alcohol as pool liquid. The orthogonally intersecting tunnel geometries with varying tunnel depth of 0.5 mm, 1 mm and width of 0.61 mm, 0.725 mm were developed on copper test sections by using wire-electric discharge machining (Wire-EDM) process. The experimental tests were carried by varying heat flux input in the range of 0-300 kW/m^2 for water and 0-250 kW/m^2 for isopropyl alcohol. The experimental results indicated that the variation in tunnel dimensions significantly affects the heat transfer performance of the surfaces. The comparison of heat transfer coefficients (HTC) indicated that the orthogonally intersecting tunnel structures augmented the boiling heat transfer performance. For water, the heat transfer coefficient was enhanced up to 250% with considerable reduction in wall superheat. Present experimental study reveals that the tunnel structure enhances the liquid transport network to active nucleation sites on the surface delaying dry out and improves liquid vapor interaction on surface.*

Key words: *Enhanced surfaces, Tunnel geometries, Isopropyl alcohol, Heat flux, Pool boiling.*

1. Introduction