

## Enhancement of Pool Boiling Regimes by Sand Deposition

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**Abstract :** A lot of researches was dedicated to the evaluation of the efficiency of the uniform constant and temporary coatings enhancing a heat transfer rate. Our goal is an investigation of the sand coatings distributed by both uniform and non-uniform forms. The sand of different sizes (0.2-0.4-0.6 mm) was attached to a copper ball (30 mm diameter) surface by means of PVA adhesive as a uniform layer. At the next stage, sand spots were distributed over the ball surface with an areal density that ranges between one spot per 1.18 cm<sup>2</sup> (for low-density spots) and one spot per 0.51 cm<sup>2</sup> (for high-density spots). The spot's diameter value varied from 3 to 6.5 mm and height from 0.5 to 1.5 mm. All coatings serve as a heat transfer enhancer during the quenching in liquid nitrogen. Highest heat flux densities, achieved during quenching, lie in the range 10.8-20.2 W/cm<sup>2</sup>, depending on the sand layer structure. Application of the enhancing coating increases an amount of heat, evacuated by highly effective nucleate and transition boiling, by a factor of 4.5 as compared to the bare sample. The non-uniform sand coatings were increasing the heat transfer rate value under all pool boiling conditions: nucleate boiling, transfer boiling and the most severe film boiling. A combination of uniform sand coating together with high-density sand spots increased the average heat transfer rate by a factor of 3.

**Keywords :** heat transfer enhancement, nucleate boiling, film boiling, transfer boiling

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