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## Effect of filling ratio on the performance of a novel miniature loop heat pipe having different diameter transport lines

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### Abstract

The effect of different filling ratios on the heat transfer performance of a novel miniature loop heat pipe (mLHP) having different diameter transport lines is experimentally studied. The different diameter transport lines are used to prevent reverse flow of vapour through the liquid line. The miniature loop heat pipe made of copper having square flat evaporator is tested using distilled water as the working fluid for the filling ratios of 20%, 30% and 50% in a heat load range of 20-380W. The experimental study shows that the filling ratio has significant impact on the heat transfer performance of miniature loop heat pipe. Filling ratio of 30% is identified as optimum filling ratio for this heat pipe. The thermal resistance values varied between 1.15K/W and 0.106K/W for three filling ratios in the tested heat load range. The optimum filling ratio gave the lowest evaporator wall temperature at all heat loads and at the highest heat load of 380W it had a lowest value of 94.3°C. The thermal efficiency of the miniature loop heat pipe lies in the range of 78-87% for the optimum filling ratio. The value of figure of merit is also calculated to understand its variation with filling ratios and heat loads. The experimental results confirm the suitability of the new design for cooling applications in a heat load range of 20-380W.

**Keywords:** miniature loop heat pipe, filling ratio, distilled water, screen mesh wick, flat evaporator, transport lines

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