

## Fabrication and Characterization of Heat Pipe with Composite Structure for the Adiabatic Section

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### *Abstract:*

**Background:** Innovative cooling technology is required in every field of life, ranging from satellite to terrestrial applications. A novel heat rejection system is of great concern for space applications. Futuristic applications in heat pipe will involve composite structures in various ways as they offer flexibility in design with their inherent advantage of being lightweight. However, it remains a challenge to join a composite structure with metals. This study investigates the effect of a composite section in the adiabatic region of the heat pipe and also proposes a novel approach to join metals with a composite structure.

**Methods:** A flexible composite tube, such as carbon fiber, reinforced thermoplastics to make the adiabatic section. This section is adhesively bonded with the metal tubes, i.e., evaporator and condenser section. The inherent roughness of the metal tube makes the first layer for mechanical interlocking, followed by adhesive bonding.

**Results:** The effect of adiabatic, condenser, and evaporator length, for a normal vs. composite heat pipe, on specific thermal conductivity is evaluated.

**Conclusion:** The numerical studies confirm that the use of composite material for the adiabatic section improves the performance of the heat pipe. It is proposed to use reinforced thermoplastic as the material for the adiabatic section.

**Keywords:** Heat pipe, composite material, thermal resistance, adiabatic section, evaporator section, condenser section.