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Thermal Performance of Two-Phase Thermosyphon Loop in Rotating Thin Pad

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Motor rotor cooling play crucial role for the technology advancement of an electric motor with high power density. The coolant flow in rotating passage is affected by Coriolis force and centrifugal buoyancy. The attendant influences on turbulent characteristics, flow structures and interfacial mechanics act simultaneously to alter the thermal performance form the stationary scenarios. It remains as a difficult task to measure the boiling flow structures and heat transfer rates with negative gauge pressures at rotating conditions. Fig. 1(a) depicts the boiling flow snapshots at stationary and rotating conditions. As the dimensionless rotation number (Ω) increases, the boiling structure yields from slug flow to nucleate boiling conditions with strings of coherent mini vapor bubbles. The corresponding thermal performances shown by Fig. 1(b) exhibits the decrease of total thermal resistance as Ω increases. The applicability of two-phase heat transfer device operated at negative gauge pressures is assumed for future developments of passive motor rotor cooling devices.

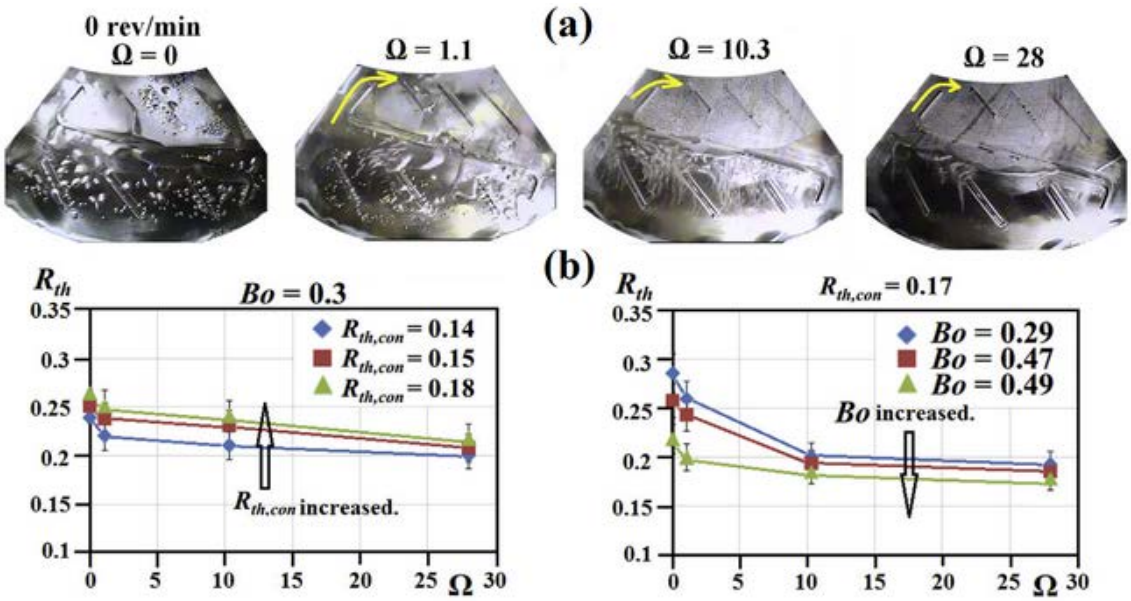

Fig. 1. (a) boiling flow snapshots at stationary and rotating conditions (b) variations of total thermal resistance of rotating thermosyphon pad against Ω.