Fabrication and characterization of a suspended gold micro heater on a high aspect ratio ultra-thin silicon nitride membrane

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Abstract

Micro heaters are widely used in various applications, including gas sensing, biological research, and electrical/mechanical engineering. The development of micro heaters suspended in ultra-thin membranes offers several benefits, including better thermal isolation, faster response times, and low power requirements, making them suitable for use in applications such as gas sensing and portable/wearable devices. In this study, we fabricated a high aspect ratio micro heater measuring 100 µm x 100 µm with a thickness of 30nm, featuring patterned gold heating elements on its surface, and compared its characteristics with those of its non-suspended counterparts. To better understand the thermal behaviour of the micro heater, we developed a thermal lump model and performed Multiphysics simulations to study the effects of various factors. Additionally, we carried out temperature measurements using an IR camera and compared them with theoretical and simulated values. Our findings and unique microheater design could provide new insights into the design and optimization of micro heaters for a range of applications, including biological research and medical diagnostics.

References

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