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MEMS non-magnetic electric heating chip for integrated atomic sensors XIAOYANG LIANG, YUCHEN JIA, BINQUAN ZHOU, BeiHang University — The alkali metal vapor cell of most atomic devices requires high temperature and non-magnetic environment, while the heating current will introduce additional magnetic field and unexpected magnetic flux density gradient. It is necessary to develop a non-magnetic heater for atomic devices. In this paper, a new design for non-magnetic heating chip, fabricated by the MEMS technique, is proposed for the integrated atomic sensors. Platinum (Pt) is chosen as the material of resistance. The chip is composed of two layers of the same serpentine-shaped resistors to cancel the magnetic flux density. There are two sets of wires in each layer used as a thermometer resistor and a heating resistor forming a feedback loop of temperature control. The integration of heating and temperature measurement is beneficial for the miniaturization of physics package. The simulation results show that magnetic effect between layers can be reduced by 4 orders than in one layer. The experiment results show that the temperature coefficient of resistance (TCR) is approximately 0.224%/K. The consistency of the resistance is better than 97.7%. The fluctuation of temperature at 383.15 K is under 10 mK. The magnetic flux density introduced by the current in the Z direction is 0.22146 nT/mA.

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