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Development of MEMS-based thermal flow sensors for high sensitivity and wide range of flow rate[1] WOONG KANG, HAE MAN CHOI, YONG MOON CHOI, Korea Research Institute of Standards and Science — We have proposed and demonstrated a novel design of MEMS-based thermal mass flow sensor for high sensitivity and wide flow range. Thermal mass flow sensors are able to measure small amount of gas flow such as process control gas via heat transfer phenomena between heater and thermopiles. To understand characteristics of the correlation between sensing performance and geometry of sensor components like heater and thermopile, various designed models were fabricated by using MEMS technology considering manufacturing efficiency. A evanohm R alloy heater and chromel-constantan thermopiles were formed on a $Si_3N_4/SiO_2/Si_3N_4$ sandwich type membrane for thermal performance enhancement. Characteristics tests between flow rate, heat power and sensitivity for fabricated models were conducted in low pressure gas flow standard system of KRISS (Korea Research Institute of Standard and Science) with MFC (Mass Flow Controller). Finally, the optimum geometry based on the non-uniform distribution of heater and thermopiles was determined according to characteristics comparison of designed and fabricated models. The developed thermal mass flow sensor can be adopted for low range flow rate (0 – 200 sccm) and also high one (up to 10 SLM) with high sensitivity.

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Woong Kang
Korea Research Institute of Standards and Science

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