

고온, 고전압용 SiC 마이크로 히터 설계, 제작 및 특성

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Design, fabrication and characteristics of 3C-SiC micro heaters for high temperature, high powers

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Abstract : This paper describes the characteristics of a poly 3C-SiC micro heater which was fabricated on AlN(0.1 μm)/3C-SiC(1.0 μm) suspended membranes by surface micro-machining technology. The 3C-SiC and AlN thin films which have wide energy band gap and very low lattice mismatch were used sensors for high temperature and voltage environments. The 3C-SiC thin film was used as micro heaters and temperature sensor materials simultaneously. The implemented 3C-SiC RTD (resistance of temperature detector) and the power consumption of micro heaters were measured and calculated. The TCR (thermal coefficient of the resistance) of 3C-SiC RTD is about -5200 ppm/ $^{\circ}\text{C}$ within a temperature range from 25 $^{\circ}\text{C}$ to 50 $^{\circ}\text{C}$ and -1040 ppm/ $^{\circ}\text{C}$ at 500 $^{\circ}\text{C}$. The micro heater generates the heat about 500 $^{\circ}\text{C}$ at 10.3 mW. Moreover, durability of 3C-SiC micro heaters in high voltages is better than Pt micro heaters. A thermal distribution measured and simulated by IR thermovision and COMSOL is uniform on the membrane surface.

Key Words : Poly 3C-SiC, AlN, micro heater, RTD, TCR