FABRICATION AND ELECTRIC PROPERTY OF RTD SENSOR FROM POLYMER DERIVED SICN

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ABSTRACT

A novel fabrication process of for polymer derived ceramic (PDC) is introduced. SiCN RTDs (Resistive Thermal Detector) which can be applied for high-temperature heat flux sensors were completed using polymer, called as Ceraset (KiON). The fabrication is completed using direct-contact soft lithography method to improve resolution. The relationship between UV exposure time and thickness of the patterned polymer precursor was investigated. The RTDs are obtained by pyrolysis at 1100°C in N_2 followed by annealing at different temperatures (1200°C, 1300°C, and 1400°C) to find the temperature dependency. The result shows the conductivity of SiCN RTD clearly relies on the temperature.

I. INTRODUCTION

Over the decades, fabrication of MEMS sensor such as RTD and heat flux sensor using PDC material for harsh environment application is still ongoing interesting issue. Particularly, various PDC fabrication techniques have been developed recently including molding, photolithography[1]. For photolithography method, from our contact UV exposure method, a process for spin coating of polymer can be neglected and the thickness of polymer can be controlled. As performed in Haluschka et al[2], the electrical conductivity of PDC SiCN is affected by atmosphere and annealing temperature. We have investigated the electrical conductivity for polysilazane 20.

II. PROCESSES and ELECTRICL PROPERTY

Detail fabrication processes are illustrated in Figure1, The main difference compared with non-contact method is using microscope cover glass to perform direct-contact exposure and to improve resolution of RTD patterns. Because direct-contact method only consumes several drops of precursor, it can solve green issue problem. Figure 2 shows thickness control by UV exposure time and the completed RTDs. As shown in Figure 3, the RTDs have clearly different conductivity with annealing temperature.

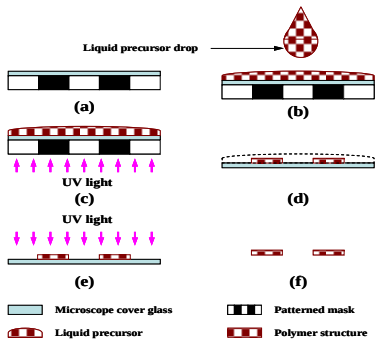
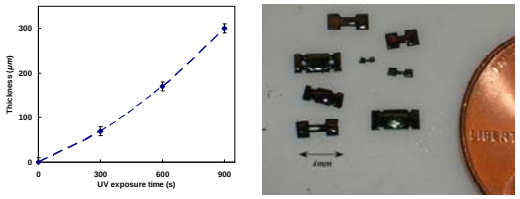


Figure1. Fabrication processes



(a) (b)

Figure 2. (a) The results of thickness depending on UV exposure time and (b) several RTDs after heat treatments

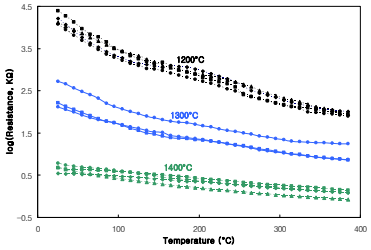


Figure 3. Temperature dependency of conductivity of RTDs with different annealing temperatures.

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