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Study of SiN_x films used as protective layer on Ni film flow sensors

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Abstract

In this study, silicon nitride (SiN_x) protective films were deposited on flexible Ni film flow sensors using ion beam assisted deposition (IBAD). Microstructures of the Ni films with and without SiN_x protective layer were analyzed by X-ray photoelectron spectroscopy (XPS) and X-ray diffractometer (XRD). The effect of SiN_x protective layer on the performance stability of flexible Ni film flow sensor on polyimide substrate was investigated. The results showed that the SiN_x film was composed of the stoichiometric nitride Si_3N_4, Si_3N_2 and oxynitride $SiO_{1.6}N_{0.3,}$ and that the SiN_x protective layer presented amorphous structure. The resistivity of the Ni film without SiN_x protective layer increased and the temperature coefficient of resistivity (TCR) decreased after exposure in the air for 102 days, while the electrical properties of Ni film with SiN_x protective layer changed negligibly, highlighting the importance of the SiN_x protective layer in improving the performance stability of Ni film flow sensors. The flexible sensor subjected to different flow velocity has been tested, and the results show that the output voltage decreased with increasing flow velocity within the flow

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