壓電微型感測元件在牙根穩固度監測上之研發製作

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Abstract

In this study, we designed and also implemented: the integration processes of an integrated circuit for a microsensor, which can be used in monitoring the initial stability of dental implants and the process of osseointegration of bone-implant interfaces. The substrates used in these experiments were p-type (100)-oriented Si wafers with a resistivity of 5-10 ?-cm. The Si wafers were prepared through an RCA clean process. After undergoing RCA cleaning, silicon carbide was prepared using a high-density plasma chemical vapor deposition (HDP-CVD) system. A PZT thin film was prepared by the Sol-Gel method, and this method was also used for microsensor fabrication. The interdigital electrodes were fabricated by a lift-off process. Properties of the device and thin film were evaluated by physical analyses. Resistance was varied and measured with an HP4145B semiconductor parameter-analyzer to investigate the electrical properties of the microsensor. In material preparation of the PZT thin film, we had to select the best process for our experiment. The Sol-Gel process was determined to be the best for our experiment, because it is easy to control the composition and there are fewer impurities in solution. In addition, it is a low-temperature process, so this can decrease the diffusion phenomenon seen at high temperatures. Furthermore, the properties of the precursors can be varied by adjusting the viscosity and solvent contents, and various electrical properties were created. Based on the above description, the Sol-Gel process was selected for our experiment. Based on the above investigation, in order to assess the requirement of precision detection, many functional devices were integrated on a chip. Up to now, the most surface acoustic wave (SAW) microsensor devices were fabricated by abnormal IC technology. However, this results in the high cost and large-used device area. To reach cost down and promote the device performance, SAW microsensor device and transistor can be integrated on a chip. This is called system on a chip (SoC). The processes of microsensor devices and transistor must be compelled. The purpose of this study is to discuss the dental implant and osseointegration stability by SoC integration.