Bulk Titanium Micromachining using Deep Reactive Ion Etching

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Résumé

Over the past three decades, deep reactive ion etching (DRIE) has emerged as a promising technique for the fabrication of microtechnological devices. Successful etching depends on understanding the physico-chemical mechanisms involved and overcoming a series of challenges. Although this technology was originally developed for semiconductor manufacturing, it has shown great promise in other material-processing applications including bulk titanium etching.
Titanium has been widely used as a biomedical material due to the excellent biocompatibility properties and biostability which results from the spontaneous formation of an oxide layer in air or blood. It has also proven to be a remarkably interesting material for bulk micromachining. So far, however, little work has been done to explore deep titanium etching.

The current work details efforts to develop high-aspect-ratio bulk titanium etching processes for the design of microelectromechanical systems (MEMS). Reactive ion etching (RIE) using chlorine/fluorine gases and positive photoresist mask permit etch depths of up to several hundreds of microns.
Our research is based on the application of titanium micromachining technology to the creation of biomedical devices. Among the advantages resulting from the overlap between the medical field and that of microfabrication are the reduction of costs, the miniaturization and the improvement of systems properties.

Mots-Clés: titanium, deep reactive ion etching, DRIE, bulk micromachining, biomedical

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