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Review

Reversible sealing techniques for microdevice applications

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ABSTRACT

Reversible sealing of two different functional layers is an advancing and effective technique for the fabrication of microdevices. Reversible sealing enables microdevices to be dismountable and reusable, which are promising features for the high throughput analysis by means of spatial, temporal, and parallel process. It is therefore reversible sealing is potentially being used for various research fields such as micro and nanodevice fabrication, flow analysis at microscale, biomolecule analysis, cell analysis and other related fields. This review reports on the materials and techniques used for reversible sealing and their applications in various research areas, and illustrates their advantages and disadvantages. We provide examples, where necessary and comment on the outlook for reversible sealing applied to microdevices.

Contents

1. Introduction

Microdevices have great importance to applications in various biological fields including protein analysis [1], DNA analysis [2–7], enzymatic assays [8], immunoassays [9,10], and cell analysis [11–13]. Microdevices have many advantages over conventional devices such as smaller size, less usage of samples and reagents, decreased waste production, reduced reaction time and power requirements, increased throughput and portability, integration with other miniaturized devices, and potential for parallel operations [14–16]. Great efforts have been made to make microdevices more functional, efficient and cost effective, including the finding of new materials, and fabrication techniques [17,18].

Developing novel materials and proper sealing methods is a key aspect in the fabrication of microdevices. Material selection is important for proper sealing and to ensure compatibility for a particular application. Sealing methods are also important to combine layers to make microdevices, and to interconnect or couple

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