
Fundamentals of Microfluidics and Lab on a Chip **for Biological Analysis and Discovery 1st Edition Li** **Solutions Manual**

2 Micromachining

1. Glass substrates commonly used for chip making are (a) soda-lime, (b) borosilicate and (c) fused silica or quartz.

The process of photolithography starts with the generation of a photomask which is produced by laser or e-beam ablation. Then, a glass substrate which is coated with Cr/Au metals and with photoresist is exposed to UV radiation through the photomask. The substrate is then developed to expose the Au/Cr etch mask, which is in turn developed to expose the glass. This is etched to produce glass channels. Finally, all the remaining photoresist and metals are removed to leave only glass on surface.

2. An etch mask is formed on top of the glass substrate to protect the area that is not intended for etching; whereas a photomask is placed on top of the etch mask to transfer the pattern on it by UV exposure.

3. Both positive and negative photoresists are used to transfer the pattern for etching onto a substrate by photolithography. For positive resists, exposure to UV light weakens the chemical structure of the resist so that it becomes more soluble in, and is washed away by, the developer solution. The photomask, therefore, contains an exact copy of the pattern which is to be fabricated on the substrate.

Negative resists behave in just the opposite manner. Exposure to the UV light causes the negative resist to become polymerized, and thus more difficult to dissolve. Therefore, the negative resist remains on the surface wherever it is exposed, and the developer solution removes only the unexposed portions. Photomasks used for negative photoresists, therefore, contain the inverse or photographic "negative" of the pattern to be transferred.

4. The addition of NH_4F is used as an F^- buffering solution to maintain the etch rate of HF.

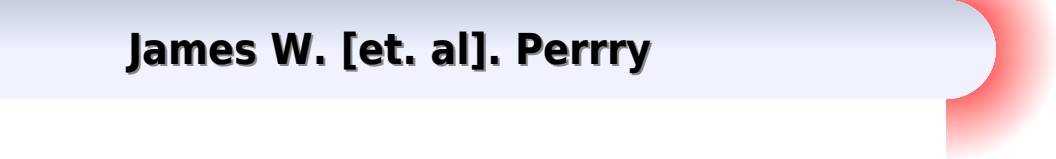
Without buffering, as HF is consumed, the etch rate would decrease. But with buffering of F^- from NH_4F , the etch rate will become more uniform.

5. Deep-glass etching increases the channel depth, and hence the optical pathlength in absorbance or fluorescence detection is enhanced. This is useful in enhancing the optical signals, and so the optical detection sensitivity is increased.

6. RIE (reactive ion etching) is a method used to perform anisotropic etching of Si. Reactive gas species, such CF_4 or SF_6 , are used to produce a plasma in the etch chamber. In this dry etch process, charged gaseous species formed in the plasma react with the surface Si atoms. The product species then leave the surface thermally, if the vapour pressure is high enough, or as a result of ion bombardment.

Biological Patterns Lab Manual Answers

James W. [et. al]. Perry



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Crime Scene Investigation Laboratory Manual Marilyn T Miller, 2018-01-05 Crime Scene Investigation Laboratory Manual Second Edition is written by a former crime scene investigator and forensic scientist who provides practical straightforward and immediately applicable best practices Readers will learn the latest techniques and procedures including deconstructing first responder contamination the preliminary walk through utilizing associative evidence enhancing trace biological and chemical evidence and reconstructing scenes through wound dynamics glass fracture patterns bloodstain patterns ballistics and more This lab manual provides information and examples for all aspects of crime scene investigation In addition included exercises teach the proper techniques for securing documenting and sealing a crime scene how to visualize or enhance the evidence found how to package and preserve the evidence and how to reconstruct what happened at the crime scene This manual is intended to accompany any crime scene investigation textbook Designed to complement any text used in crime scene investigation courses Contains over 20 proven exercises and material from actual crime scenes providing students with hands on learning Written by an experienced educator and former crime scene investigator forensic scientist

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Biologically Biological Sciences Curriculum Studies,2002-02-13 **Laboratory Manual in Biology** Paul B. Weisz,1955

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Instructor's Manual for the Laboratory Manual for Starr and Taggart's Biology : The Unity and Diversity of Life and Starr's Biology Concepts and Applications James W. [et. al]. Perry,2002

Biology Laboratory Manual Darrell S. Vodopich,Randy Moore,1998-12 This laboratory manual is designed for an introductory majors biology course with a broad survey of basic laboratory techniques The experiments and procedures are simple safe easy to perform and especially appropriate for large classes Few experiments require a second class meeting to complete the procedure Each exercise includes many photographs traditional topics and experiments that help students learn about life Procedures within each exercise are numerous and discrete so that an exercise can be tailored to the needs of the students the style of the instructor and the facilities available

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