
Etch Terminology Activity

Etch Overview for Microsystems Learning Module Participant Guide

Description and Estimated Time to Complete

In this activity you will demonstrate your knowledge of etch for microsystems terminology. This activity consists of two parts:

- A **crossword puzzle** that tests your knowledge of the terminology and acronyms associated with etch processing, and
- **Post-activity questions** that ask you to demonstrate a better understanding of etch and its application to MEMS fabrication.

If you have not reviewed the unit *Etch Overview for Microsystems*, you should do so before completing this activity.

Estimated Time to Complete

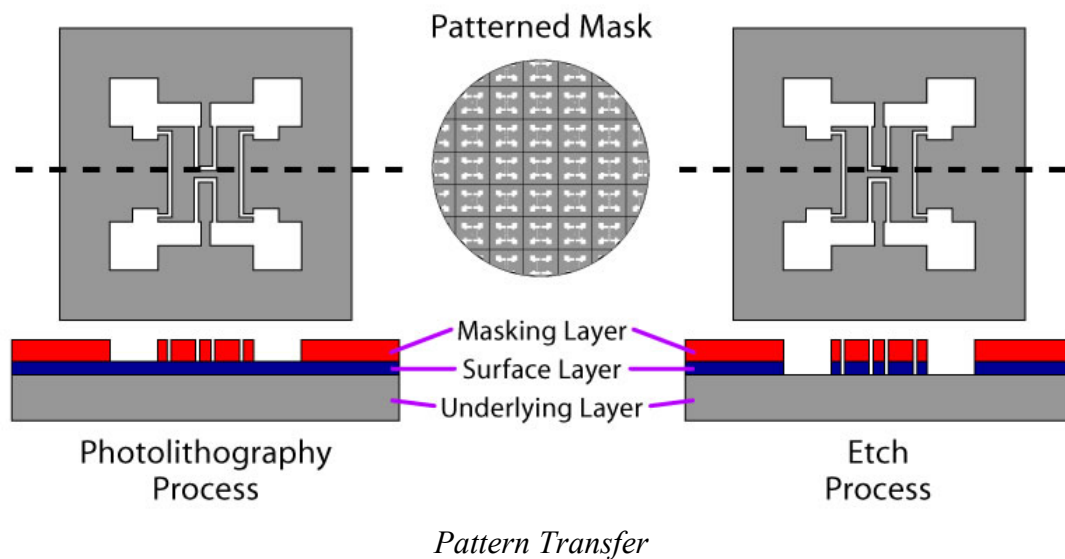
Allow at least 30 minutes to complete this activity.

Introduction

For microsystems fabrication etch is a process that removes select materials from

- the wafer's surface,
- below the wafer's surface, or
- from within the substrate.

The etch process normally follows photolithography or deposition during which a protective mask or layer is applied to the wafer's surface. The protective mask is to identify the material to be etched and to protect material that is to remain. The graphic (Pattern Transfer) illustrates a patterned mask incorporated into a photosensitive layer (or protective mask) on the wafer's surface (Photolithography Process). During the Etch Process (right), that pattern is transferred into the surface layer, exposing areas of the underlying layer.



Activity Objective

Activity Objectives

- Identify the correct terms used for several definitions or statements related to etch.
- Describe the etch process as it applies to microsystems fabrication.

Resources

SCME's *Etch Overview for Microsystems PK*

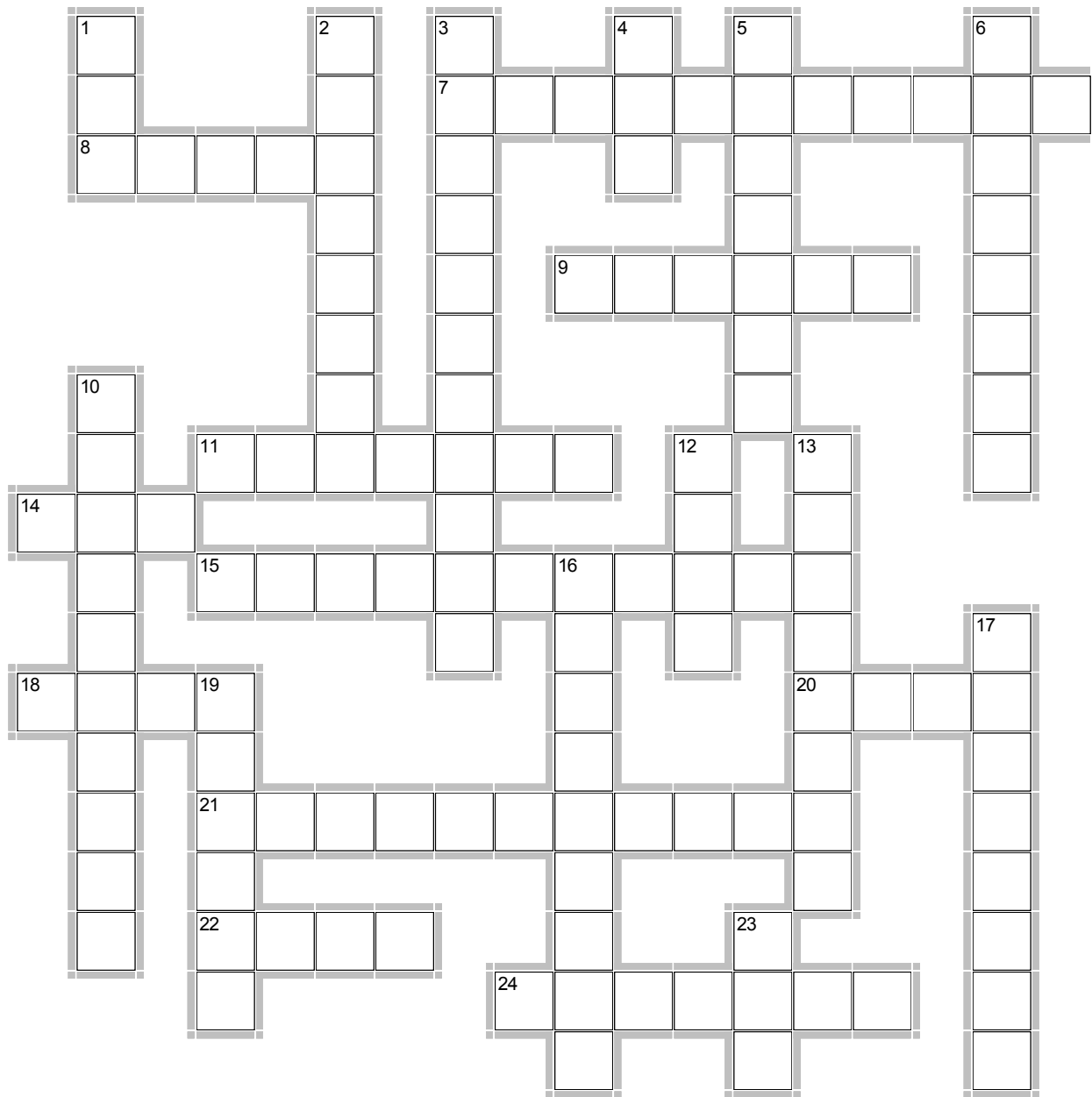
Documentation

1. Completed Crossword Puzzle
2. Questions and Answers to the Post-Activity Questions

Activity: Etch Terminology

Procedure:

Complete the crossword puzzle using the clues on the following page.

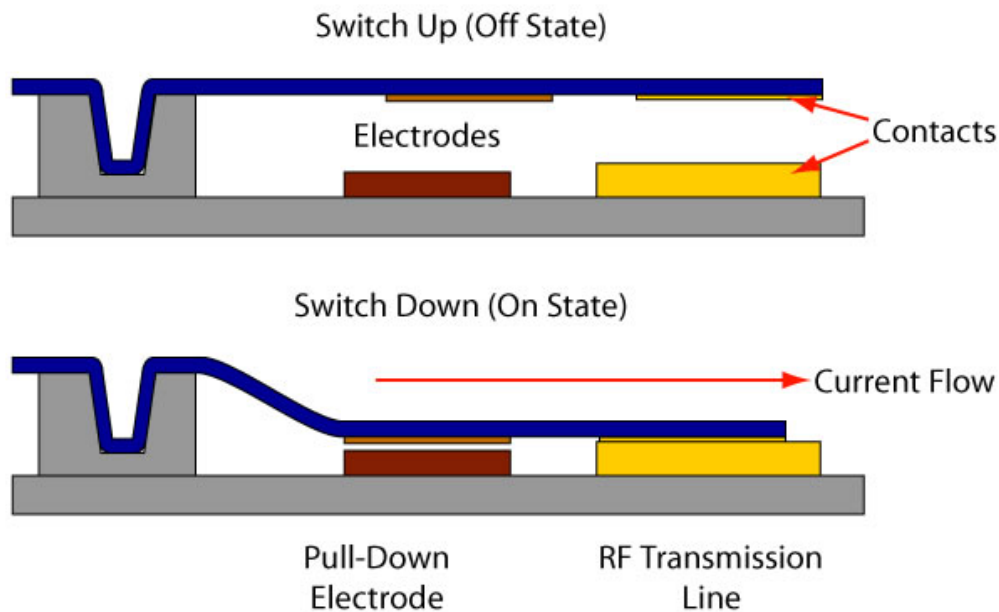


EclipseCrossword.com

ACROSS	Answers
7. The ratio of the etch rate of material to be etched divided by etch rate of masking material.	
8. Second step of the wet etch process.	
9. Type of films used for conductive layers.	
11. An etch that frees a microsystem component from an underlying layer.	
14. An etch process that uses a high energy plasma	
15. The layer that is completely removed to allow mechanical devices to move.	
18. The mask _____ layer determines the endpoint of the etch.	
20. The microsystems fabrication process that removes material from a wafer chemically and/or physically.	
21. Straight wall geometries result from this type of etch.	
22. A layer that defines the pattern to be etched.	
24. A type of dry etch process that uses a focused beam of ions to physically etch select material on the wafer.	
DOWN	
1. Quick-dump-rinse.	
2. Type of etch that removes select material through a chemical reaction.	
3. The ratio of the height of an etched feature divided by its width (2 words)	
4. The type of etch process that uses liquid etchants.	
5. An active chemical solution or mixture used to etch films.	
6. Angstroms of film removed divided by time (2 words).	
10. A layer having the mechanical and electrical properties needed for a MEMS component.	
12. Etch process that creates high aspect ratio holes and trenches.	
13. Also called substrate etching (2 words).	
16. The type of etch profile that results from a chemical etch.	
17. A type of etch where ions bombard the surface of the wafer causing a sputter of surface material.	
19. An ionized and energized gas consisting of ions, electrons, and radicals.	
23. A process that uses a low pressure plasma allowing for a combination of both chemical and physical etching.	

Post-Activity Questions / Answers

1. The etch process can be performed several times during the fabrication of a microsystem; however, the purpose of the etch as well as the type etch process can be different. Describe the purpose(s) and applications of surface etch and bulk/release etch in the fabrication of microsystems.
2. Discuss the differences between a chemical etch and a physical etch.
3. Discuss the etch requirements (types of etch processes and etched layers) required for the RF switch shown in the graphic below.



Summary

In microsystems fabrication, etch processes are used to remove bulk material from within a substrate, select material from within thin film layers, and complete layers above and below other thin film layers.

Several different types of etch processes are required to form the various shapes and structures found in microsystems. Such process include

- Wet etch (isotropic and anisotropic)
- Dry etch (physical, chemical, and both)

RIE and DRIE are dry etch processes that use both chemical and physical etch to form the required shapes. DRIE provides the high aspect ratio cavities required for the advancing technologies of micro and nanosystems.

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