

---

# Photolithography Overview for Microsystems

## Activity – Terminology

### Participant Guide

#### Description and Estimated Time to Complete

In this activity you demonstrate your knowledge of photolithography terminology. This activity consists of two parts:

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

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

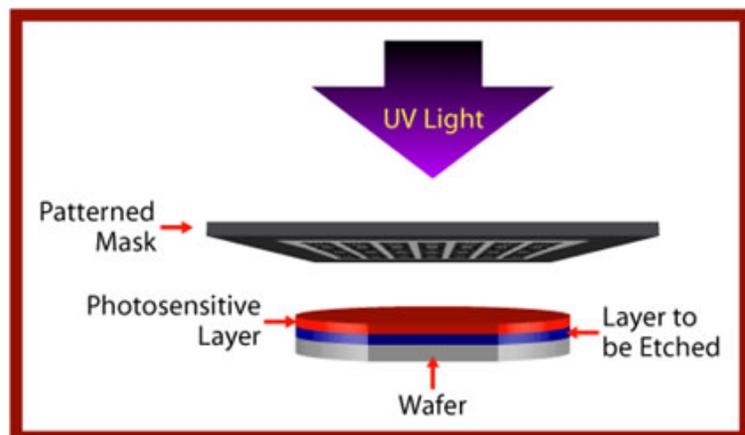
#### Estimated Time to Complete

Allow at least 30 minutes to complete this activity.

#### Introduction

Photolithography is the process that defines and transfers a pattern onto a layer of the wafer. In the photolithography process a light source is typically used to transfer an image from a patterned mask to a photosensitive layer (photoresist or resist) on a substrate or thin film. This same pattern is later transferred into the substrate or thin film (layer to be etched) using a different process (etch process).

For some layers, the resist pattern is used as a mask for a deposition process. In such cases, the patterned resist would identify the areas that receive the deposited material and the areas that do not.



## **Activity Objective**

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

## **Resources**

SCME's *Photolithography Overview for Microsystems PK*

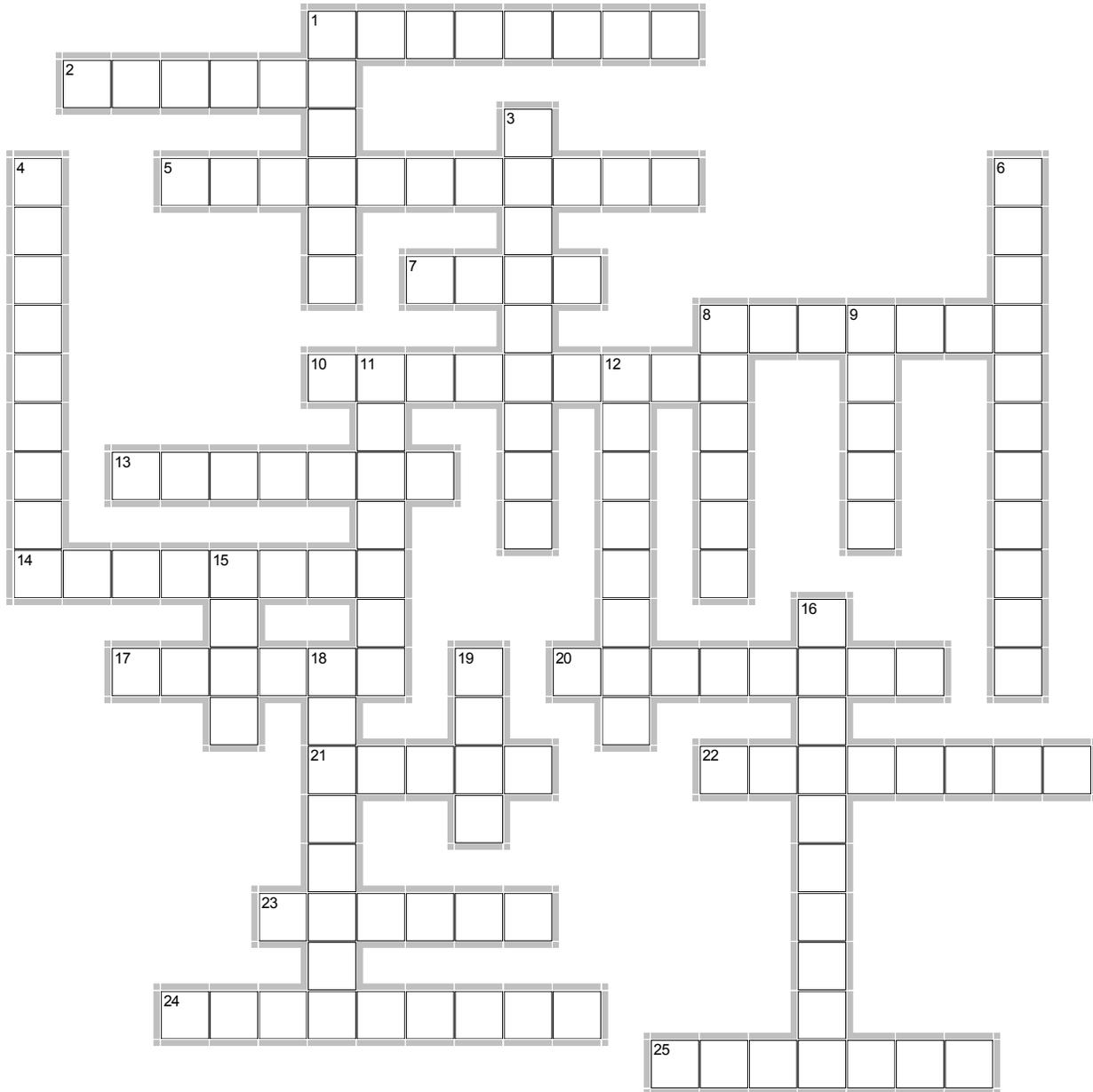
## **Documentation**

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

## Activity: Photolithography Terminology

### Procedure:

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



EclipseCrossword.com

ACROSS	Answers
1. Type of resist that hardens when exposed to UV light	
2. The photolithography step that transfers a pattern using a UV light source.	
5. UV	
7. Hexamethyldisilazane	
8. Used to stop the reaction of the chemical developer with the photoresist.	
10. The base material or foundation on or in which MEMS components and circuits are constructed.	
13. A quartz plate, used in steppers, that has the pattern for one field or one or more die at one given layer.	
14. An underdeveloped or underexposed pattern results in this type of defect.	
17. A light sensitive thin film spun onto a wafer during the coat step of the photolithography process.	
20. A type of resist that becomes more soluble in developer after being exposed to UV light.	
21. During the exposure process, the wafer is adjusted in the z-axis and also may be tilted to adjust the _____ plane of the image.	
22. The photolithography process step that hardens the photoresist after it has been developed.	
23. A _____ holds the wafer on the chuck during the spin coating process step.	
24. When you measure the critical linear dimension of a structure, you measure the _____ (2 words).	
25. The removal of select photoresist material after exposure is done during the _____ process step.	

DOWN	Answers
1. A portion of the electromagnetic spectrum (in the range of 300 nm – 400 nm) containing wavelengths often used to expose photoresist. (Hint: It is not DeepUV but _____.)	
3. Prepare the surface of the wafer for the coat process.	
4. The resist parameter that is affected by rpm	
6. A fear of water	
8. A portion of the electromagnetic spectrum (in the range of 100-250nm) containing wavelengths often used to expose photoresist. Due to the smaller wavelengths, this process can produce smaller structures.	
9. To match (overlay) the pattern on one layer to the pattern on a previous layer.	
11. During expose, a chemical reaction takes place as the result of absorbing _____.	
12. HMDS is used to promote the _____ of resist to the wafer's surface.	
15. A quartz plate that contains the desired pattern for an entire wafer	
16. High powered optical equipment used to inspect wafers at the end of the photolithography process.	
18. The photolithography process step that removes most of the solvents from the resist after the spin coat process.	
19. The application of resist to the wafer surface.	

## Post-Activity Questions

1. Discuss the purpose of photolithography as it applies to the fabrication of microsystems.
2. Create an outline of the photolithography process.

## Summary

Photolithography uses three basic process steps to transfer a pattern from a mask to a wafer: coat, develop, expose. Within each step are secondary steps that ensure the wafer is properly conditioned, the patterns are accurately aligned, and problems and defects are identified. The pattern is then transferred into the wafer's surface or an underlying layer during a subsequent process (such as etch). The resist pattern can also be used to define the pattern for a deposited thin film.

*Support for this work was provided by the National Science Foundation's Advanced Technological Education (ATE) Program through Grants. For more learning modules related to microtechnology, visit the SCME website (<http://scme-nm.org>).*