Southwest Center for Microsystems Education (SCME)
University of New Mexico

Manufacturing Technology Training Center (MTTC) Pressure Sensor Process

This learning module provides a detailed, step-by-step fabrication process of a MEMS (MicroElectroMechanical System) pressure sensor. One of the activities is designed for a cleanroom environment where you perform each step of the process and end up with a working MEMS pressure sensor. If you don't have access to a cleanroom, the other activities provide the opportunity to better understand each process step as well as the process as a whole.

Target audiences: High School, Community College, University

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Website: www.scme-nm.org

Pressure Sensor Process Knowledge Probe
Participant Guide

Introduction

The MTTC Pressure Sensor Process learning module provides a detailed, step-by-step fabrication process of a MEMS (MicroElectroMechanical System) pressure sensor. One of the activities is designed for a cleanroom environment where you perform each step of the process and end up with a working MEMS pressure sensor. If you don't have access to a cleanroom, the other activities provide the opportunity to better understand each process step as well as the process as a whole.

The purpose of this knowledge probe is to determine your current knowledge and understanding of the basic processes used to construct a MEMS pressure sensor. This quiz will not be graded; therefore, answer to following questions to the best of knowledge.

There are ten (10) quiz questions. All of the questions and answer are relative to the MTTC Pressure Sensor fabrication process, a process developed at the University of New Mexico. This process is similar to processes found in MEMS manufacturing facilities.

1. What types of micromachining processes are used in the MTTC pressure sensor fabrication process?
    a. Surface and LIGA
    b. Bulk and LIGA
    c. Surface and Bulk
    d. Surface only

2. What is the first thin film layer deposited on the silicon wafer?
    a. Photoresist
    b. Lift-off resist
    c. HMDS
    d. Silicon Nitride

3. The first photolithography develop process patterns the _____ layer on the _____ of the wafer.
    a. Photoresist, frontside
    b. Photoresist, backside
    c. Silicon nitride, backside
    d. HMDS, backside

4. A RIE or reactive ion etch is used to etch the _____ layer on the _____ of the wafer.
    a. metal, frontside
    b. Photoresist, backside
    c. Silicon nitride, frontside
    d. Silicon nitride, backside

5. Which of the following BEST describes the purpose of HMDS?
    a. Acts as the anchor for photoresist in the lift-off process
    b. Provides better adhesion of the photoresist to the wafer's surface
    c. Is the hard mask for the KOH etch on the wafer backside
    d. Is the hard mask for the RIE etch on the wafer backside

6. Which of the following process steps is followed immediately with a piranha (H_2SO_4/H_2O_2) strip?
    a. Frontside photoresist strip after the gold / chrome layer is etched
    b. Frontside photoresist strip after the silicon nitride layer is patterned
    c. Backside photoresist strip after the silicon nitride is etched
    d. Backside photoresist strip after the photoresist is patterned

7. Which of the following is necessary to ensure a selective lift-off?
    a. Chrome
    b. KOH
    c. HMDS
    d. LOR

8. KOH is used to remove or etch which of the following material?
    a. Silicon nitride
    b. Photoresist
    c. Gold/Chrome
    d. Silicon

9. Which of the following BEST describes the purpose of the LOR layer?
    a. Ensures proper adhesion of the photoresist on the frontside of the wafer prior to depositing the gold layer
    b. Provides a hard mask that is not chemically reactive with KOH and allows for the selective etching of silicon
    c. Provides a photosensitive layer that develops *faster* than photoresist, creating the desired undercutting below the photoresist
    d. Because the LOR chemically reacts with acetone, it dissolves during lift-off taking the unwanted gold with it

10. Which of the following BEST describes the outcome of the KOH etch process?
    a. Selectively etches cavities on the backside of the wafer, the full depth of the wafer under the circuits on the silicon nitride membrane
    b. Patterns the silicon nitride on the wafer backside to open up select areas that will be used as the reference pressure chambers
    c. The KOH dissolves the LOR during the lift-off process allowing the unwanted gold to lift-off
    d. Removes all of the photoresist remaining on the wafer after all of the other processes have been completed

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