RCA-2 Silicon Wafer Cleaning

INRF application note
Process name: RCA02

Overview

The famous RCA-2 clean (sometimes called ("standard clean-2"), developed by Werner Kern at RCA laboratories in the late 1960's, is a procedure for removing metal ions from silicon wafers. The decontamination works based on sequential oxidative desorption and complexing with H2O2-NCI-H2O (RCA-2). Typically this is preceded by an RCA-1 clean (SC-1, H2O-NH4OH-H2O) to remove organic residues. In the process, it oxidizes the silicon and leaves a thin oxide on the surface of the wafer.

This is a level-1 process and requires basic INRF safety certification. The use of dangerous chemicals requires that the user may not perform the process alone.

Time needed

This process takes 30 minutes to complete in total.

Materials needed

Hydrogen chloride
Hydrogen peroxide
Pyrex bath containers
Hot plate

Preparation

Setup time for this process is about 5 minutes. This process takes about 20 minutes to complete. The general recipe for RCA-2 cleanser is: 6 parts water (H2O), 1 part 27% hydrogen chloride (HC1), 1 part 30% hydrogen peroxide (H2O2).

300ml DI water
50ml HCI
50ml H2O2 (30%)

Procedure

Put 300ml DI water in a Pyrex beaker, carefully add 50ml HCI and then heat to 70+/-5 deg C on hot plate. Remove from hot plate and add 50ml H2O2 (30%). Solution will bubble vigorously at 1-2 minutes, indicating that it is ready for use. Soak the silicon wafer in the solution for 10 minutes. When finished, remove the wafer and rinse with clean DI water.

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Clean up

To dispose of the RCA-2 solution, let cool to room temperature. Then pour in INRF labeled waste container. Close, but do not tighten, waste lid to allow escape of any additional gases that might be generated.

Safety and emergency

All INRF safety and procedural regulations must be followed. Review the INRF standard operating procedures for fire, chemical spill, and chemical exposure. Use of RCA-2 requires at least one other person in the clean room (buddy system). RCA-2 clean should be performed in a laminar flow bench, using nitrile gloves and eye protection.

Hydrogen peroxide is an explosive chemical. Never leave the RCA process unattended. Do not store the hydrogen peroxide near the hot plate or any other source of heat. Any small spills should be wiped up immediately with wipes. Dispose of wipes in the corrosive waste container.

In case of exposure to skin or eyes flush immediately with water for 15 minutes. Remove all clothing that are exposed and flush with water. Report to INRF staff or report to EH&S. Seek medical attention to ensure that the burns are minimal.

In case of large spill follow the INRF Standard Operating Procedure for chemical spills.

References

Prudent Practices in the Laboratory, National Research Council, 1995.

W. Kern and J. Vossen, Eds., *Thin Film Processes,* Academic Press; New York, 1978, Ch V-1.

W. Kern, Ed., *Handbook of Semiconductor Cleaning Technology,* Noyes Publishing: Park Ridge, NJ, 1993, Ch 1.

RCA-2 wafer clean
Checklist

The following checklist is designed to aid the researcher when performing this process.

Prepare RCA-2 bath: 6 parts water (H2O), 1 part hydrogen chloride (HCI), 1 part 30% hydrogen peroxide (H2O2).

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Soak wafer in RCA-2 bath at 70 deg C for 10 minutes.

DI rinse and blow dry.

Clean up, dispose of wastes.