RCA-2 Silicon Wafer Cleaning

INRF application note
Process name: RCA02
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Overview
The famous RCA-2 clean (sometimes called "standard clean-2", SC-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 $\text{H}_2\text{O}_2$-NCl-$\text{H}_2\text{O}$ (RCA-2). Typically this is preceded by an RCA-1 clean (SC-1, $\text{H}_2\text{O}_2$-$\text{NH}_4\text{OH}$-$\text{H}_2\text{O}$) 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 is for RCA-2 cleanser is: 6 parts water ($\text{H}_2\text{O}$), 1 part 27% hydrogen chloride ($\text{HCl}$), 1 part 30% hydrogen peroxide ($\text{H}_2\text{O}_2$).

- 300 ml DI water
- 50 ml HCl
- 50 ml $\text{H}_2\text{O}_2$ (30%)

Procedure [RCA-2]
Put 300 ml DI water in a Pyrex beaker, carefully add 50 ml HCl and then heat to 70±5° C on hot plate. Remove from hot plate and add 50 ml $\text{H}_2\text{O}_2$ (30%). Solution will bubble vigorously after 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.

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 hotplate or any other source of heat. Any small spills
should be wiped up immediately with wipes. Dispose the 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


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 (HCl), 1 part 30% hydrogen peroxide (H₂O₂).
- Soak wafer in RCA-2 bath at 70 °C for 10 minutes.
- DI rinse and blow dry.
- Clean up, dispose wastes.