

# Spin-On Glass (SOG) Processing

## Standard Operating Procedure

Faculty Supervisor: Prof. Robert White, Mechanical Engineering (x72210)

Safety Office: Peter Nowak x73246 (Just dial this directly on any campus phone.)

(617)627-3246 (From off-campus or from a cell phone)

Tufts Emergency Medical Services are at x66911.

Revised: July 7, 2015

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### Goal:

Deposit, bake and cure a standard non-doped spin-on glass thin film as dielectric or for planarization use.

### Warnings:

The chemicals you are working with here are not acutely hazardous. However, all processing (including hotplate bakes) must be done in the fume hood, as the solvent fumes released during processing have long-term health effects. The main things is to not breathe any fumes, not to get any spin-on glass solution on your skin.

### **1.0 Material Requirements:**

**1.1 Equipment and tools:** Spin processor, photoresist oven, photoresist hotplates, wafer tweezers,

**1.2 Chemicals:** Undoped Spin-on Glass (NDG-5000 or NDG-7000R from Desert Silicon Inc.),

**1.2.1 Hazards associated with chemicals:**

**1.2.1.1** Spin-on Glass NDG-5000 and NDG-7000R contains Ethanol (40-74%), Tetraethyl Orthosilicate (20-60%), Ethyl Acetate (5-10%) and Isopropyl Alcohol (<5%). It is a combustible liquid and vapor. It's hazardous in case of skin contact (irritant), of eye contact (irritant), or inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion. Repeated or prolonged exposure to the substance can produce target organs damage.

**1.3 Engineering Controls:** Conduct procedures in the fume hood. Dispose of chemicals as described at the end of this document.

**1.4 Personal Protective Equipment:** Nitrile gloves and eye protection required for all procedures.

### **2.0 Procedure:**

**2.1** Wafer should be clean prior to starting processing. A Piranha clean (see Piranha clean SOP) is suggested.

**2.2** Dehydration bake your wafers at 200°C.

**2.2.1** Perform dehydration back on a clean hotplate (5 min) or in the clean convection oven (30 min).

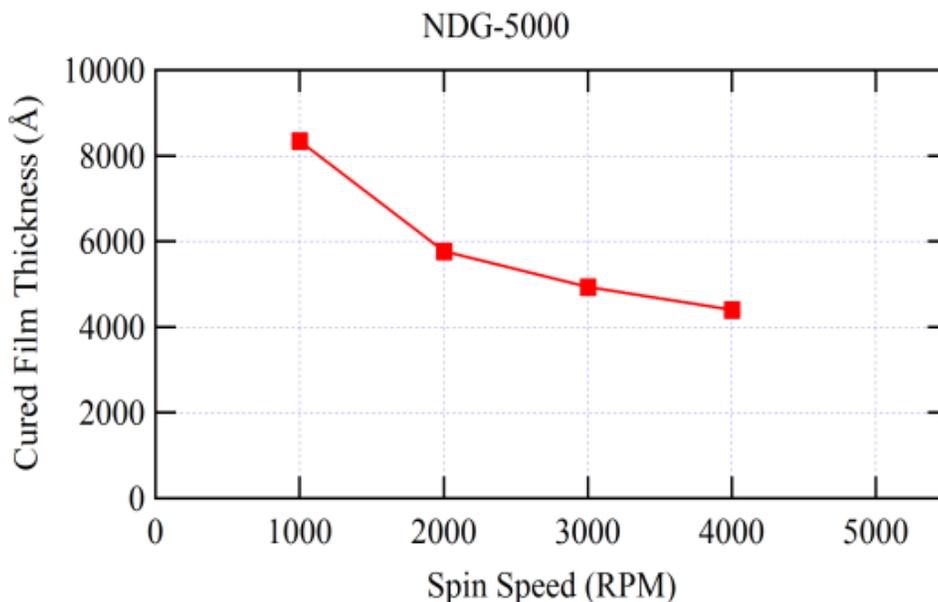
**2.3** Center your wafer on the 'dirty' spinner (SU-8 spin-coater) using the alignment tool and turn on the vacuum. (See Laurell Spinner SOP for more information).

**2.4** Spin on your photoresist. (See Laurell Spinner SOP for instructions on using the spinner.)

**2.4.1** Use a disposable pipette dispense enough SOG to coat ~80% of the wafer. Do not put too much on so it overflows and gets on the back of the wafer.

**2.4.2** Spread at 500 rpm for 4 sec

**2.4.3** Spin for 30 sec. Spin rate (RPM) needs to be determined based on which photoresist viscosity you have purchased, and what final thickness you require. Spin speed curve is available in following graph.



- 2.5 Remove the wafer from the spinner using the wafer alignment tool.
- 2.6 Soft bake (should be conducted with the hotplates in the chemical hood or under the snorkel) at 200°C in air or nitrogen for 5 minutes.
- 2.7 Load Samples into quartz boat and then into furnace. Use temperature ramping to prevent wafer warpage. Cure samples at 600°C or higher in nitrogen for 30 minutes or longer. Then ramp down and take out wafers. (See Thermolyne 47900 Furnace for further information.)
- 2.8 Cleanup:
- 2.8.1 Turn off the hotplates.
  - 2.8.2 Clean off any SOG residue from any tools or surfaces using acetone, isopropanol, and cleanroom wipes. Dispose of in the solvent/photoresist trash.
  - 2.8.3 Remove the hotplates from the hood.
  - 2.8.4 Make sure the spinner has been cleaned according to the procedures in the Spinner SOP.

**3.0 Storage:**

- 3.1 SOG should be stored in fridge. The shelf life of SOG at room temperature is 3 months and over one year at 0-4°C.

**4.0 Waste Disposal:**

- 4.1 SOG waste:
- 4.1.1 Solid waste should go in the solvent/photoresist trash.
  - 4.1.2 Liquid waste should go in the solvent/photoresist liquid waste bottle.

**5.0 Accident Procedures:**

- 5.1 Contact: Read MSDS prior to working with any chemical to familiarize yourself with the symptoms of exposure and recommendations for treatment.
- 5.1.1 There are solvent fumes from the SOG. If you breathe these fumes, you may feel dizzy. If this occurs, turn off the hotplates and leave everything in the hood. Leave the room and get some fresh air. If symptoms persist, contact Tufts health services and inform the lab directory and Tufts health and safety office. **Call Tufts Emergency Medical Service at x66911.**
  - 5.1.2 Skin contact from SOG will cause irritation and minor burning. For minor contact, exit the lab and rinse the affected area with water. For major contact (such as breaking a large bottle of SOG so it splashes all over you) get in the safety shower and remove the affected clothing. Have someone call emergency health services. **Call Tufts Emergency Medical Service at x66911.**
  - 5.1.3 Eye contact: Immediately flush with water for at least 15 minutes at eye wash station while lifting upper and lower eyelids occasionally. Get immediate medical attention. **Call Tufts Emergency Medical Service at x66911.**

**5.2 Spill:**

**5.2.1** If a small, contained spill occurs, such as inside the hood, wipe it up with chemical wipes and dispose of in the solvent trash container.

**5.2.2** If a large spill occurs that you are not comfortable cleaning up, such as breaking a bottle on the floor, evacuate the lab and contact Tufts emergency services (x66911).

**5.3 Fire:** There is a fire hazard associated with SOG. Do not put it on or near the hotplates when they are turned on. If a fire starts, remove any solvents from near the fire if it is safe to do so, and exit the lab. Do not try to fight the fire. **Immediately contact Tufts emergency services once you are outside the lab at Tufts Emergency Services at x66911.**

If at any time you feel a situation is dangerous, do not hesitate to call the safety office (x73246, Peter Nowak) or the faculty supervisor (x72210, Robert White). Please inform of the faculty supervisor and/or the health and safety office of any accident or health concern.

**Report all accidents (injuries, major spills, fires) to the safety office at x73246 (Peter Nowak) and the faculty supervisor at x72210 (Robert White). For emergencies, call Tufts Emergency Services at x66911.**