UCSC
Laboratory Standard Operating Procedure (SOP)
Chitosan Hydrogels

Department:	Chemistry and Biochemistry	**Date:**	12/10/2015
Principal Investigator/Supervisor:	Yat Li	**Office Phone#:**	(831)459-1952
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Location(s) covered by this SOP/Building/Room#:	PSB 198	**Author Email:**	Tliu23@ucsc.edu

Review any applicable manufacturer/vendor safety information, such as a Safety Data Sheet (SDS), before developing the Standard Operating Procedure (SOP).

Any deviation from this SOP requires approval from the PI.

#1 Brief Experimental Summary: *Provide a general description of the process and/or experimental procedure.*

Glutaraldehyde is used to synthesize chitosan hydrogels.

List the chemicals that fall under this SOP, include CAS#, and GHS symbols and categories:

Chemical (CAS#)	GHS categories	GHS symbols – *choose the appropriate symbols for each chemical*
Glutaraldehyde (111-30-8)	Acute toxicity, Oral (Category 4), H302 Acute toxicity, Inhalation (Category 4), H332 Skin corrosion (Category 1B), H314 Serious eye damage (Category 1), H318 Respiratory sensitisation (Category 1), H334 Skin sensitisation (Category 1), H317 Acute aquatic toxicity (Category 1), H400 Chronic aquatic toxicity (Category 2), H411	
DI Water (7732-18-5); Chitosan (9012-76-4)	Not a hazardous substance or mixture.	NA

#2 Procedure Description: *Include all steps for the procedure from the preparation to waste disposal, along with decontamination/clean-up steps. For each step's description, include any step-specific hazard, personal protective equipment, engineering controls, designated work areas, and specific working alone restrictions in the left hand columns. Note the location and use of any emergency response equipment specific to process (e.g., Calgonate gel, Class D fire extinguisher, inert absorbent material).*

Working Alone: Working alone is not recommended. Notify your coworkers prior to conducting this work and ensure that at a minimum of 1 person is nearby and aware that the work is occurring.

Scale: Work on as small a scale as possible. Do not exceed volumes/masses of 10 mL, without prior consultation with and approval by the PI.

Procedure Steps	Work Location / Safety Equipment	Precautions
All the following steps must be conducted in the fume hood of PSB 198. 1. Use a disposable glass pipette to transfer 10 mL glutaraldehyde stock solution (50 wt%) into a 25 mL glass vial. 2. Use the same glass pipette to transfer 10 mL deionized water into the glass vial to dilute the glutaraldehyde solution to 25 wt%. 3. Label the vial.	**Fume Hood in PSB 198**	**Return the glutaraldehyde stock solution reagent bottle immediately to the flammable cabinet after using.** Note: Glutaraldehyde can cause occupational asthma and skin sensitization responses such as contact

4. When needed, use a disposable glass pipette to transfer 240 µL 25 wt% glutaraldehyde solution into 20 mL 1 wt% chitosan aqueous solution. Let the two solutions sit for about 1 min and carefully pour the mixed solution into a petri dish. 5. After 10 min sitting, a clear hydrogel can be formed.		dermatitis. Avoid inhalation and skin contact. See Section 5 for special training requirements. No glutaraldehyde aqueous solution should be left behind. If accidentally pipetting more glutaraldehyde than needed, dump the excessive amount of solution into a waste bottle with a proper waste tag on it.

Chemical Equation Graphic (optional):
Click here to enter text.

#3 Personal Protective Equipment (PPE): *List the personal protective equipment used during this process.*

Note: PPE is to be worn by those conducting the work and any adjacent personnel.

Eye Protection: ANSI-approved properly fitting safety glasses or goggles. Chemical splash goggles and/or full face shield during activities which pose a splash hazard.

Body Protection: An appropriately-sized lab coat must be worn and buttoned. Laboratory coat sleeves must be of sufficient length to prevent direct skin exposure while wearing gloves. Full length pants (or equivalent) and closed toe/heel shoe attire must be worn at all times by all workers who are occupying or entering a laboratory/technical area. The area of skin between the pants and shoe should not be exposed.

Check box for specialty lab coat: ☐Nomex/Flame Resistant ☐Biological Barrier ☐Other Click here to enter text.

Hand Protection: Wear chemical-resistant gloves; remove gloves and wash hands with soap and water after use. Double gloves may provide additional protection for some chemicals. Nitrile gloves are recommended for glutaraldehyde. Do not use neoprene (chloroprene), PVC or latex gloves when handling glutaraldehyde.
If prolonged contact or immersion is anticipated, consult with EH&S to identify appropriate protective gloves.

Additional Protection: ☐ Face Shield ☐ Chemical-Proof Apron ☐ Respiratory Protection
☐ Additional Gloves Click here to enter text. ☐ Other Click here to enter text.

#4 Incompatible Conditions and Materials: *List the incompatible conditions, chemicals, and/or materials that should be avoided, along with the safe storage conditions.*

Click here to enter text.

Material:	Incompatibility:	Storage Conditions:
Glutaraldehyde	Strong acids, Strong bases, Strong oxidizing agents	Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Recommended storage temperature: -20 ℃. Store under inert gas. Air sensitive.

#5 Training: *Training required for all personnel conducting this procedure. Include any specific training requirements.*

- Complete EH&S online "Laboratory Safety Fundamentals" class available through the UC Learning Center (http://learningcenter.ucsc.edu/).
- Review and sign Lab-Specific Training Checklist (http://ehs.ucsc.edu/lab-safety-manual/training.html#lab-specific%20training) with PI, Lab Safety Representative, or other designated person.
- Review SOP with knowledgeable person.
- Complete training on specialized equipment prior to use (e.g., ultracentrifuge, hydrogenation apparatus).

- Other EH&S training requirements (e.g., Biosafety, Radiation Safety, Hazardous Waste Management).
- Training/information required by footnote in 8 CCR 5155 Table AC-1: "Glutaraldehyde can cause occupational asthma and skin sensitization responses such as contact dermatitis. Exposure related symptoms may include one or more of the following: shortness of breath, chest tightness, wheeze, cough, skin rash, hives, and irritation of the nose, throat, skin or eye. Hazard communication training required by sections 5191 or 5194 shall address these health hazards and symptoms along with the measures taken by the employer to evaluate and control exposures that can include medical evaluations, exposure monitoring, ventilation systems, work practices, and personal protective equipment. The communication system required by section 3203 shall inform employees where to report possible health symptoms and where to ask questions, report concerns, and receive information about the employer's evaluation and control measures."

#6 Clean-Up, Spill, and Emergency Response Procedures (reference the SDS as needed): *Provide any specific information.*

Decontamination/Clean-Up: Wash bench and/or work area with soap and water after using.

Specific Spill Clean-Up Procedures: While wearing the appropriate PPE (See section #3), absorb spilled solutions with paper towels and dispose in a solid hazardous waste container in the fume hood. Click here to enter text.

Do not attempt to clean up any spill or release for which you are not fully trained and equipped. For assistance with spill cleanup, dial **911** and ask dispatch to page EH&S.

- Isolate the area to prevent the spread of contamination (e.g. close doors to affected area, post warning signs, alert others in immediately vicinity to evacuate).
- Prevent spill from reaching drains or from spilling outside of the fume hood if possible to do so without exposing yourself to liquid or vapor.
- Clean the affected area and all exposed equipment with soap and water to remove any contaminants before resuming work.
- Spill clean-up materials should be disposed of as hazardous waste.

Laboratory Emergency Response Equipment: *All research personnel must know location of nearest fire alarm pull station and emergency shower/eyewash. Do not use fire extinguisher unless you are trained to do so. List locations for nearest fire alarm pull and emergency shower/eyewash.*
Fire alarm pull station: Outside the lab, face to the lab entrance
Emergency shower: Near the entrance of the lab area, beside several gas cylinders
Emergency eyewash: The same place as the emergency shower listed above.

Emergency Shutdown Procedures: Click here to enter text.
Remove all ignition sources.
Close fume hood sash.
Evacuate all personnel.
Call 911 and ask dispatch to page EH&S.

#7 Hazardous Waste(s): *List expected concentrations and amounts of hazardous waste(s) generated during this process. Provide any special/specific waste management. Contact EH&S for specific guidance regarding hazardous waste handling and disposal. General hazardous waste management guidelines: http://ehs.ucsc.edu/programs/waste-management/index.html*

Waste Labeling
- Affix an on-line hazardous waste tag on all waste containers using the WASTe application https://ehs.ucop.edu/waste/ as soon as the first drop of waste is added to the container.

Waste Storage
- Store hazardous waste in closed containers with cap, in clean secondary containment, segregated by hazard class, in a marked and designated waste accumulation area.
- Double-bag dry waste using transparent bags.
- Waste accumulation area must be under the control of the person generating the waste.

Waste Disposal
- Hazardous waste must be removed from the lab within 180 days.

- Containers must be clean, sealed, and safe to transport.
- Mark container as ready for pick up in WASTe, move container to accumulation area.
- Contact EH&S at x9-3086 or hazwaste@ucsc.edu with any questions.

#8 First Aid / Emergency Procedures: *Describe immediate First Aid or medical treatment required in case of personnel exposure*.

Click here to enter text.

For immediate medical assistance, dial **911**. Report all serious injuries to EH&S as soon as possible.

- If inhaled, move into fresh air immediately.
- In the case of eye or skin contact, flush with water for a minimum of 15 minutes. Ensure that eyelids are held open while rinsing eyes.
- If ingested, flush mouth with water (only if the person is conscious).
- In the case of a needlestick/puncture injury, wash the affected area with soap and warm water for 15 minutes. For employees, follow the instructions at the Risk Services website: http://risk.ucsc.edu/workers-comp/reporting-and-treatment.html
- Seek medical attention immediately.
- Complete incident report form, http://risk.ucsc.edu/all-forms/wc-incident-report-form.pdf, (contact EH&S) and/or follow the instructions at the Risk Services website: http://risk.ucsc.edu/workers-comp/reporting-and-treatment.html

As the Principal Investigator, it is your responsibility to ensure that all individuals conducting this protocol are taught the correct procedures for safe handling of the hazardous materials involved. It is also your responsibility to ensure that your personnel complete Laboratory Safety Training and other applicable safety training courses.

- Prior to conducting any work with, the PI or designee must provide training to his/her laboratory personnel regarding the specific hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training.

I have reviewed and approve this Standard Operating Procedure.

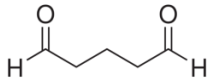
☒ I understand that checking this box constitutes my approval of this document on 1/5/2016

PI Signature/Approval: Yat Li DATE

Chemical Information Summary

Provide information for all chemicals included in the SOP. See the SDS for detailed toxicity information. Add more lines as needed.

Physical & Chemical Properties

Chemical	CAS#	Molecular Formula	Structure	Molecular Weight (g/mol)	Density (g/mL)	Form (physical state)	Melting Point (℃)	Boiling point (℃)	Flash point (℃)
Glutaraldehyde	111-30-8	$C_5H_8O_2$		100.12	1.061	Liquid	-10 (14 ℉)	101 (214 ℉) at 1,013 hPa (760 mmHg)	No data available

Exposure Limits/Toxicity Data

Chemical	Color	Odor	Cal/OSHA PEL	Toxicity LD_{50}
Glutaraldehyde	Colorless	NA	0.05 ppm (Ceiling)	Oral - Rat - 134 mg/kg; LC_{50} Inhalation - Rat - 4 h - 0.48 mg/l

Documentation of Training (signature of all users is required)

I have read and understand the content of this SOP:

Name	Signature	Date