Appendix A Designated Substance Assessment Form

RECORD OF DESIGNATED SUBSTANCE ASSESSMENT

SUBSTANCE:	Arsenic
DATE:	Sept. 2006

COMPANY: McMaster University

DEPARTMENT OPERATIONS:

Canadian Centre for Electron Microscopy (CCEM)

Transmission Electron Microscopy (TEM) Sample Preparation

LOCATIONS:

Sample Preparation Room, ABB-B161/F

ASSESSMENT PREPARED BY:

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TITLE:

Research Associate, Research Engineer, Materials Characterization Specialist, Electron Optics Coordinator

DATE PREPARED: Sept. 2006

APPLICATION – WORKSHEET 1: IS THE DESIGNATED SUBSTANCE PRESENT?

1. Do any material safety data sheets from your suppliers indicate the presence of the substance?

YES [x] NO [ ]

2. If substance is present, indicate the department where it is used, nature of the use (i.e. Direct or Indirect), and the quantity used per month or year:

Product Name	Department	How Used? Direct / Indirect	Quantity Per Month / year
GaAs wafers and other III-V semiconductor wafers with layers containing GaAs compounds i.e. InGaAs etc.	BIMR, CEDT, CCEM	Indirect, preparation of TEM samples	3mm dia x 400µm disc, from 1-30 wafers/year/person

CONCLUSIONS

Read statements and check applicable box:

[ ] Substance not present anywhere in the workplace; regulation does not apply

No Assessment needed

[X] Processes / activities have been identified where substance present.

Proceed to worksheet 2

APPLICATION – WORKSHEET 2: IS WORKER EXPOSURE LIKELY?

1. In what form does the substance enter the plant?

   Product Title: *GaAs semiconductor wafer and other III-V semiconductor wafer structures, solid*

   Type of Container: *fluorowear pack* Size of Container: *3"dia x 0.5"*

2. Is this form altered during use or in the operation: YES [x] NO [ ]

   If YES, indicate the altered form: *wet polished, cut, dimpled and ion beam milled*

3. Is there a possibility of the substance being released into the workplace environment during normal use? YES [x] NO [ ]

   If YES, indicate the stage of the operation or areas where this can occur. *During polishing, cutting and dimpling.*

4. If YES to Question 3, specify the job functions and approximate number of employees who might be exposed:

Job Function	Number of Employees
Research Associate, Research Engineer, grad students, summer students	~10

5. If YES to Question 3, indicate how workers could be exposed:

   Inhalation [x] Ingestion [ ] Skin Absorption [x] Skin Contact [x]

6. If NO to Question 3, is there a likelihood of escape due to leaks, accidents, etc.?

   YES [ ] NO [ ]

7. Are workers likely to be exposed? YES [ ] NO [x]

CONCLUSIONS

Are there any activities / situations where exposure by any route is likely? YES [x] NO [ ]

If NO, no further action is necessary. Date completed: _____

If YES, an assessment is necessary – **proceed to Section III**.

Note: If protection against exposure has been left up to some engineering control measure which can fail or deteriorate for any reason, or to a work hygiene practice, an assessment is necessary – **Proceed to Section III**.

ASSESSMENT – WORKSHEET 3: PROCESS DESCRIPTION

NAME OF PROCESS: TEM Sample Preparation

	Process Flow	Description	Likely Exposure Yes / No
1.	Wafer cleaving	Cleave under a microscope, 5mm x 0.5mm GaAs bars from standard wafer, using a scriber. Bars glued together with epoxy.	No
2.	Wet polishing and Sample cleaning	Polishing/thinning of solid GaAs wafers on abrasive paper/film i.e. SiC, diamond, with water as lubricant. (Samples are first glued down to polishing puck with crystal bond melted on a hot plate.)	Yes, some arsenic compounds may be released onto abrasive paper, polishing tool, into water slurry and fume hood.
3.	Wet cutting and Sample cleaning	Cut 3mm disc from polished/thinned sample using ultrasonic cutter. Water drop used as lubricant. (Sample is first glued down to puck.)	Yes
4.	Dimpling	Make a 100µm dimple in sample using a water or kerosene/diamond paste solution.	Yes
5.	Ion milling	Sample thinned down from ~20µm, in argon ion milling machine, in vacuum. Machine vented to proper exhaust line.	No

ASSESSMENT – WORKSHEET 4: EXISTING CONTROLS

Process Flow Stage	Control Description	Problems / Recommendations
	Engineering Controls:	
2, 3	Fume hood	
	Work Practices:	
1, 2, 3, 4, 5	Lab coat, gloves, goggles. Appropriate disposable particulate respirator (3M 8233 or equivalent for As), required for stages 2, 3 and 4.	
2	Collect liquid slurry (<500ml) and dispose of in fume hood in a hazardous waste container. When finished polishing, dispose of any surface cover, polishing paper, wipes and gloves as hazardous waste. Do this in the fume hood. Ultrasonically clean sample polishing tool in water, in fume hood. Dispose of liquid as hazardous waste.	Label and use a separate water squeeze bottle for GaAs polishing. Have spare waste containers readily available. Label and place in fume hood prior to commencing work. Use a container tray underneath glass, slurry/polishing plate container dish. Do all polishing in fume hood.
2	With clean gloves, wet wipe fume hood area as a finish cleanup. Dispose of wipes as hazardous waste, Remove gloves in fume hood and dispose of as hazardous waste.	
3, 4	Clean sample mount with damp wipe and dispose of as hazardous waste.	
5		Servicing of ion milling machine to be done by qualified technician, taking proper precautions.

ASSESSMENT – WORKSHEET 5: EXISTING CONTROLS (cont.)

Process Flow Stage	Control Description	Problems / Recommendations
2, 3	**Hygiene Facilities and Practices:** Remove gloves in fume hood and dispose of as hazardous waste. Wash hands after final clean up. **Training / Information:** **WHMIS** Review MSDS for As and GaAs. Review this Arsenic Designated Substance Assessment. Review SOP with qualified technical staff. **Emergency Procedures / Equipment:** In case of spill of slurry, dry wipe with paper towels and dispose of them as hazardous waste. **Personal Protective Equipment:** Nitrile or latex disposable gloves, lab coat, goggles, disposable particulate respirator (3M 8233 or equivalent, for arsenic) Use proper polishing tool, i.e. polishing jig and centre puck.	Do not wear contaminated gloves outside fume hood area. Change gloves as necessary. Do not reuse gloves. Wear lab coat, goggles and disposable gloves. Disposable particulate respirator (3M 8233 or equivalent, for arsenic) required.

ASSESSMENT – WORKSHEET 6: JOB EXPOSURE ANALYSIS

Process Flow Stage	Job Title	Total Number of Employees	Tasks where Exposure Likely	Duration Hrs per Week	PPE Req'd to be Used
2, 3, 4	Researchers, grad students, summer students	~10	Wet polishing/thinning, wet cutting	<10 5 min.	Disposable gloves, nitrile or latex, lab coat, goggles, fume hood. Disposable particulate respirator required (3M8233 or equivalent, for arsenic)

CONCLUSIONS

Jobs / tasks to be noted during walk-through survey:

Risk of exposure to arsenic is minimal since the GaAs wafer is wet polished and wet cut in water, in a fume hood.

Personal protective equipment (PPE) including disposable gloves, lab coat, goggles, and disposable particulate respirator, and proper clean up, eliminate risk from exposure.

APPLICATION – WORKSHEET 6: HEALTH EFFECTS

1. Any reported health effects? If so, describe.

No

2. Any current Medical Program? If so, describe.

No

3. Previous exposure monitoring results? If so, describe.

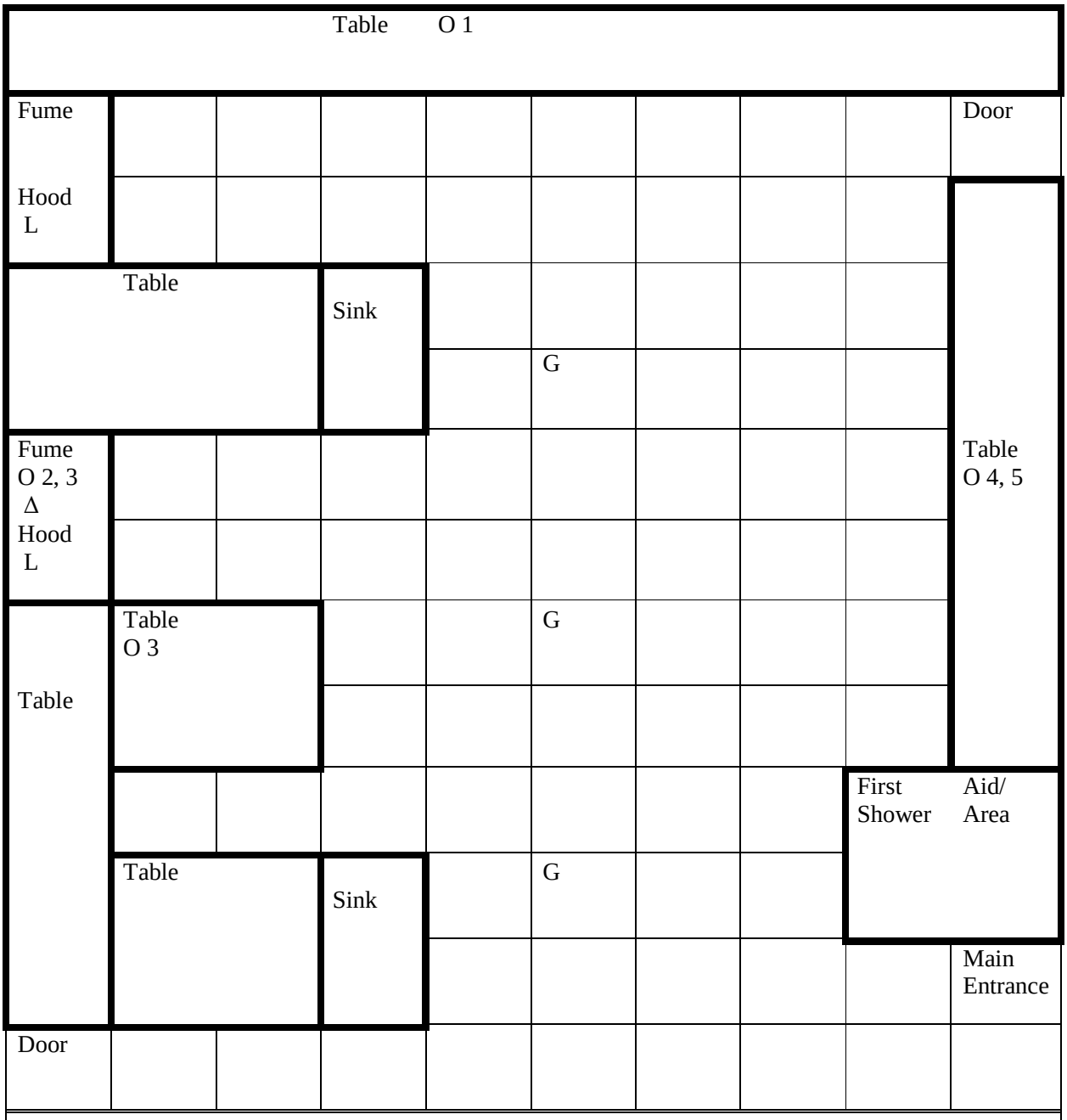
No

CONCLUSIONS

Health effects known at this stage:	YES	[ ]	NO	[x]
Further information required:	YES	[ ]	NO	[x]

APPLICATION – WORKSHEET 7: FLOOR PLAN

LOCATION: ABB-B161/F Sample Preparation Room **DATE:** Sept. 2006



DIMENSIONS: L 40 ft W 15 ft H 12 ft

O WORK STATION – enter number from job title – Worksheet 5

Δ EXPOSURE SOURCE – enter number from Process Flow – Worksheet 3

☐ VENTILATION – enter L for local exhaust, and G for general ventilation

APPLICATION – WORKSHEET 8: WALK THROUGH

Evidence of Contamination:

No

Hygiene Facilities and Work Practices:

Remove disposable gloves in fume hood after polishing and clean up. Dispose of as hazardous waste in fume hood. Wash hands afterwards.

Ventilation Systems:

Typical laboratory ventilation plus fume hood exhaust.

Storage Facilities:

Polished GaAs wafer pieces stored in plastic petrie dishes.

Byproducts of wet polishing: water, slurry, polishing paper, gloves etc. treated as hazardous waste.

Dispose of these in the fume hood, in appropriate sealed and labeled, bags and containers. Containers may be stored outside the fume hood for future waste disposal.

APPLICATION – WORKSHEET 8: WALK THROUGH (cont.)

Dispensing Procedures:

N/A

Housekeeping:

Waste containers/ bags available and properly labeled. Extra waste labels readily available.

Sinks for wash up and hand washing are on site.

Personal Protective Equipment:

Goggles, disposable gloves, lab coat. Appropriate particulate respirator (3M 8233 or equivalent)

Emergency Facilities / Procedures:

N/A

APPLICATION – WORKSHEET 9: WALK THROUGH CONCLUSIONS

1(a). Were any areas found where controls are required or where existing controls may require improvement?

YES [ ] NO [x]

1(b). If YES, indicate the areas where the controls may be required or where existing controls may require improvement.

AREA	SUGGESTED IMPROVEMENTS

2(a). Personal exposure monitoring is required. YES [ ] NO [x]

2(b). If YES, indicate where:

3. Indicate any workers for whom medical testing and / or examinations may be required.

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APPLICATION – WORKSHEET 6: HEALTH EFFECTS

[x] CONCLUSION A: NO WORKER'S HEALTH MAY BE AFFECTED

[ ] CONCLUSION B: A WORKER'S HEALTH MAY BE AFFECTED.

OVERALL CONCLUSION

A control program is necessary. YES [ ] NO [x]

Improvements needed in existing program:

DATE Oct. 17, 2006 SIGNED

Oksana Hulko

Manager, CCEM