

RSPHys Risk Assessment: RA_054382 – D3 Sputter Operation

- This form is used when a documented risk assessment is required in accordance with Appendix A of WHSMS Handbook Chapter 3.1.
- Original risk assessments must be provided in a convenient location accessible by all people affected by the risk assessment.
- Static risk assessments must be forwarded to local WHS Manager for inclusion in the School Static Risk Assessment Register.

Static Risk Assessment No.		Assessment Date	Reviewed by Date	Version	Top Residual Risk
RA_054382 – D3 Sputter Operation		09/06/2026	09/06/2028	1.0	Low
Name of the activity	ANFF Laboratory Work – Nanofabrication for users and process development for sputter deposition using AJA ATC2200. Hazards Assessed: Electrical, Chemical, Plant and Equipment and Ergonomics and Manual Tasks				
Description of the activity	Thin film deposition of metal and dielectrics such as Au, Zn, SiOx, ZnO, ITO etc,				
School/ Department	Research School of Physics, EME, ANFF	Location	Building 160, Level 3, Room P3.51		
Risk Assessment Team Have you completed ANU WHS Risk Management Training? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No IF NO, DO NOT PROCEED	Person responsible for the area	Horst Punzmann	Email	horst.punzmann@anu.edu.au	Ph 612 50001
	Person responsible for Equipment	Olivier Lee Cheong Lem	Email	laurent.leecheonglem@anu.edu.au	Ph 612 51698
	Name	Kaushal Vora	Email	Kaushal.Vora@anu.edu.au	Ph 0433190549
	Name	Rick Walsh	Email	Rick.Walsh@anu.edu.au	Ph 612 50105
	Name	Huma Latif	Email	Huma.latif@anu.edu.au	Ph 612 55280
Who is affected by this RA?	<input checked="" type="checkbox"/> All people at the location <input type="checkbox"/> A group of people (list right) <input type="checkbox"/> A single person (list right)	People consulted on this RA (All persons affected, or their representatives need to be consulted)			
WHS Legal and Other Requirements	Work Health and Safety Act 2011 (Cth) Work Health and Safety Regulations 2011 (Cth)		ANU WHSMS Handbook Chapter 3.1: Hazard Management ANU Chemical Management Handbook		
Type of RA	<input checked="" type="checkbox"/>	Static RA (long term, > 6 months)	Send a copy to WHS Manager and keep original locally near the activity/location, accessible to all people affected.		
	<input type="checkbox"/>	Dynamic RA (short term < 6 months)	Keep the original locally (electronically or physically) near the activity/location, accessible to all people affected.		

Risk Assessment Instruction

1. List the hazards of the activity in the 'Hazards' column of the RA Form. Include information on when and where the hazard is present during the activity.
2. Determine the inherent risk of the hazard (no controls in place) using the definitions described in Table 1 and Table 2 and the Risk Matrix (Table 3). List them in 'Inherent Risk' column of the RA Form for each hazard.
3. Develop control measures in accordance with the Hierarchy of Control Principle (Table 4) and list them in 'Control' column of the RA Form.
4. Estimate the residual risk of the hazard after implementing all controls. Remember that engineering, administrative and PPE controls only reduce the likelihood of an event occurring, not the consequences.
5. Identify any controls that are not in place as corrective actions and implement them before undertaking the activity.
6. Obtain approval from relevant people as identified.
7. Identify if this is a static risk assessment (> 6 months) or dynamic risk assessment (< 6 months).
 - a. Static Risk Assessment: send a copy to WHS Manager– Keep on file for 7 years.
 - b. Dynamic risk assessments can be destroyed 1 year after the activity ceases.
8. Keep risk assessment assessable to the activity site.
9. Review the static risk assessments and associated safe work procedures in accordance with timeframes Described in Table 5.

Risk Assessment							
Hazards Also list where and when can the hazards present?	Inherent Risk			Control Measures When designing controls, follow the Hierarchy of Controls Principle, assigning the most effective controls before less effective controls (see Table 4). <i>List the control category and the controls for each hazard below. For any controls that are not in place, fill in the Actions table on the next page.</i>	Residual Risk		
	Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
<u>Electrical</u> ➤ Electrical Shock (both minor and major) ➤ Electrical Burns (both minor and major) ➤ Electrocution ➤ Overheating and fire	Possible	Major	High	Isolation <ul style="list-style-type: none"> • Power supply cables routed under floor Engineering <ul style="list-style-type: none"> • Residual Current Devices (RCDs) installed on all electrical circuits in the area. • Emergency Stop installed in the room Administration <ul style="list-style-type: none"> • Testing and Tagging of all electrical equipment. • Signage indicating location and type of hazard. 	Rare	Moderate	Low
<u>Plant and Equipment</u> ➤ Hot sample holder (after high temperature deposition process)	Possible	Moderate	High	Administration <ul style="list-style-type: none"> • Equipment Training – competency check • Tier 2 Training: ANU WHS Risk Management (WHSO03, Pulse) • Monitor holder temperature and unload sample only after sample temperature drops below <40°C • Signage “hot surface” indicating type of hazard on load lock • First aid kit in the gowning area. PPE <ul style="list-style-type: none"> • Gloves 	Rare	Moderate	Low

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	Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Chemical - liquid ➤ Cleaning solvents, like Isopropanol, Acetone and Ethanol, are flammable and may cause skin or eye irritation	Possible	Moderate	High	Substitution <ul style="list-style-type: none"> Only small volumes of flammable liquids (< 1 L) to be stored in the lab space adjacent to the machine. Administration <ul style="list-style-type: none"> Tier 2 Training: Hazardous Substances (WHSO11, Pulse) First Aid Equipment located in gowning area. Chemical Register up to date (Chemwatch) Chemical storage containers/vessels to be appropriately labelled. Dispose of waste materials, contaminated wipes, and broken substrates according to laboratory chemical waste procedures PPE <ul style="list-style-type: none"> Enclosed shoes, clean room suit, gloves, safety glasses 	Rare	Moderate	Low
Chemical – compressed gas ➤ N2, Ar Inert gases leak risks asphyxiation. ➤ O2 gas leak risks fire	Possible	Moderate	High	Engineering <ul style="list-style-type: none"> Operational lab ventilation system Oxygen depletion monitoring system installed in lab. Gases are fixed plumbed to equipment via certified gas installation Gas flow rate is controlled by equipment mass flow controllers. Administration <ul style="list-style-type: none"> Operate the sputter only after appropriate training 	Rare	Moderate	Low
Plant and Equipment ➤ Vacuum Chamber risk of collapse	Rare	Moderate	Low	Engineering <ul style="list-style-type: none"> Vacuum chamber design to withstand operational requirement. Emergency Stop 	Rare	Moderate	Low

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	Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Plant and Equipment ➤ Maintenance of Chamber			High	See RA_054382 – D3 Sputter Maintenance and SWP_054382 – D3 Sputter Maintenance			Low
Plant and Equipment ➤ Entanglement and trapping parts ➤ Cables running between main unit and various electronic racks and vice versa.	Unlikely	Major	High	Isolation <ul style="list-style-type: none"> All surface lying cables are routed below the floor. Engineering <ul style="list-style-type: none"> Emergency Stops available on the tool as well as in lab Stools/ benches available to access elevated areas 	Rare	Moderate	Low
Plant and Equipment ➤ Broken substrates or crucibles may create sharp fragments.	Possible	Minor	Medium	Elimination <ul style="list-style-type: none"> No controls are required except being mindful of sample Administration <ul style="list-style-type: none"> Provide appropriate sharps container for waste pipets, needles, scalpel blades, glass slides etc. In case of broken glass, appropriate cleaning tools (broom, shovel, vacuum cleaner) are available for clean-up and disposal. First Aid kit in gowning area. PPE <ul style="list-style-type: none"> Enclosed shoes, clean room suit, gloves, safety glasses 	Rare	Moderate	Low

Risk Assessment							
Hazards Also list where and when can the hazards present?	Inherent Risk			Control Measures When designing controls, follow the Hierarchy of Controls Principle, assigning the most effective controls before less effective controls (see Table 4). <i>List the control category and the controls for each hazard below. For any controls that are not in place, fill in the Actions table on the next page.</i>	Residual Risk		
	Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
Ergonomics and Manual Tasks ➤ Repetitive tasks ➤ Long duration of the same posture (e.g. standing, sitting)	Unlikely	Minor	Medium	Engineering <ul style="list-style-type: none"> Ergonomically designed chairs available Administration <ul style="list-style-type: none"> Tier 2 Training, Setting up your workstation (WHSO29, Pulse) Tier 2 Training, Manual Tasks (WHSO22, Pulse) Regular movement breaks 	Rare	Minor	Low

Actions			
The activity must not be commenced until all controls are in place. List below which controls are currently not in place, who will implement them and by when. Add additional rows as needed.			
List of Controls not in place	Who is to implement them?	Timeframe	Date Completed

If the level of residual risk is assessed as high or extreme,

1. Stop the activity immediately; AND
2. Tag out the plant/equipment; and/or
3. Secure any chemical; and
4. Implement, or seek advice from WHS Officer or Subject Matter Experts to implement, additional controls to reduce the residual risk further to Medium [Supervisor signature required];
5. If the above is not possible, seek approval from relevant authority (High – School Director; Extreme – COO).

NOTE: Approval will only be granted in exceptional circumstances after consultation with Associate Director, WEG and/or a Subject Matter Expert.

Approval required	
Worker conducted RA	Student conducted RA



Residual Risk Level	Authority required	Signature and date	Residual Risk Level	Authority required	Signature and date
Low	Person Responsible for Equipment	Olivier Lee Cheong Lem Digitally signed by Olivier Lee Cheong Lem Date: 2026.06.09 12:26:43 +10'00'	Low	Person Responsible for Equipment	
Medium	Person Responsible for Room	Horst Punzmann	Medium	Person Responsible for Room	
High	School Director		High	School Director	
Extreme	COO		Extreme	COO	

Table 1. Likelihood Table

Ranking	Description	Probability or frequency of event happening
Almost certain	The hazard is expected to lead to an event in most circumstances	A daily to monthly occurrence
Likely	The hazard could lead to an event in most circumstances	Between monthly to yearly occurrence
Possible	The hazard has led to an event at some time	Occurs once between 1 to 5 years
Unlikely	The hazard could lead to an event at some time	Occurs once between 5 to 20 years
Rare	The hazard may lead to an event in exceptional circumstances	Occurs once between 20+ years

Table 2. Consequences Table

Ranking	Injury, Illness or Disease	Plant, Equipment, and materials	Environment
Catastrophic	Fatality / fatalities or permanent disability. Permanently unable to work	Destroyed or cannot be reused	Long term permanent effect to ecosystems. Significant intervention required to remediate
Major	Requiring extensive medical treatment such as hospitalisation as in patient and possibly a Notifiable Incident LTI >1 week	Damage requiring repairs/rebuild and possible recertification prior to reuse, lost use for one or more days	Notification to environmental agency, ecosystem will need time to recover, intervention required to remediate
Moderate	Minor medical treatment injury, such as treated by a health professional, hospital outpatient, no potential to be a Notifiable Incident LTI < 1 week and can return to normal duties	Damage requiring a repair/service by a trade/technician within the day	Contamination event that does not impact on ecosystem. Short impact does not need intervention
Minor	Injury needing significant first aid treatment and can return to work within shift	Equipment able to be reset or gotten back into operation by the operator	Minor contained contamination ceasing when the short event is over, can remediate (e.g., spill kit)
Insignificant	Report only, no injury OR minor first aid (e.g., Band-Aid); short-term discomfort	Report only, no damage	Report only, no contamination

Table 3. ANU WHS Risk Matrix

	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Medium (10)	High (14)	Extreme (21)	Extreme (22)	Extreme (25)
Likely	Medium (7)	High (13)	High (16)	Extreme (20)	Extreme (24)
Possible	Low (4)	Medium (9)	High (15)	High (18)	Extreme (23)
Unlikely	Low (2)	Medium (6)	Medium (8)	High (17)	High (19)
Rare	Low (1)	Low (3)	Low (5)	Medium (11)	Medium (12)

Table 4. Hierarchy of Controls

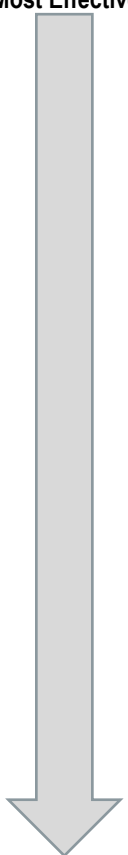
Level	Examples	Effectiveness
Elimination	<ul style="list-style-type: none"> Remove the hazards completely. Cease the activity. Dispose of unwanted hazardous chemicals or plant etc. 	<p>Most Effective</p>  <p>Least Effective</p>
Substitution	<ul style="list-style-type: none"> Use less hazardous chemicals. Use safer plant equipment. Use handset instead of telephone. Move smaller weight loads instead of large weight. 	
Isolation	<ul style="list-style-type: none"> Physical separation from the hazard by distance or complete shielding. Install guard rails around edges and holes to floors. Move workers to a new room away from hazardous noise. 	
Engineering	<ul style="list-style-type: none"> Use ventilation system. Use fume cupboard when working with hazardous chemicals. Install guarding around rotating and crushing parts. Use trolley or hoist to lift heavy loads. Use duress alarm system while doing home interview or offsite field work. 	
Administrative	<ul style="list-style-type: none"> Use Safe Work Procedures or instructions. Induction and WHS information. Training. Contingency Planning and Testing. Permit to Work system. Signage. 	
Personal Protective Equipment (PPE)	<ul style="list-style-type: none"> Lab coat. Safety glasses/face shield. Gloves/cryogenic gloves. Respirators/Masks. Personal hearing protectors. 	

Table 5. Risk Assessment and SWP review timeframe

Use this Table to determine review timeframe and frequency for the risk assessment and any safe work procedures.

Residual Risk	Review Frequency	What to do during the review.
Extreme	6 months	<p>Stop work.</p> <p>Review the control measures and introduce additional control measures to reduce the residual risk to Medium as a maximum.</p> <hr/> <p>Review the control measures.</p>
High	1 Year	
Medium	2 Years	
Low	3 Years	
<p>And/or</p> <ul style="list-style-type: none"> After an incident where deficiencies in identifying or controlling hazards have been observed When changes to the activity need to occur When significant changes (e.g., renovation) to the workplace occurs When HSRs request a review 		