

NTNU	<h2 style="margin: 0;">Hazardous activity identification process</h2>	Prepared by	Number	Date	
		HSE section	HMSRV2601	22.03.2011	
HSE		Approved by	Page	Replaces	
		The Rector		01.12.2006	

Unit: (Institute) IMA **Date:** 27.01.2020

Line manager: Jostein Mårdalen

Participants in the identification process (incl. function): This risk assessment includes experimental work carried out this spring in connection with the master thesis.
(supervisor, student, co-supervisor, others)

Short description of the main activity/main process: Slag making with CaO-Al₂O₃ in IF75 furnace, and in the blue furnace, equilibrium experiments with Si and CaO-Al₂O₃ slags in the blue furnace.

Is the project work purely theoretical? (YES/NO) No

Answer "YES" implies that supervisor is assured that no activities requiring risk assessment are involved in the work. If YES, skip rest of the form.

Is the project work safe to perform outside normal work hours (8-17)? (YES/NO) No

Responsible supervisor: Gabriella Tranell, Mertel Göknelma **Student:** Safia Hassan

ID nr.	Activity/process	Responsible person	Existing documentation	Existing safety measures	Laws, regulations etc.	Comment
1	Mixing powders to make the CaO-Al ₂ O ₃ slags	Safia		Work under a fume hood. Avoid dust formation. Avoid contact with skin, eyes, and clothing. Avoid inhalation. Wear protective gloves as CaO is hydrophilic and will pull moisture out of the skin, leading to etching damage. If on skin: wash with plenty of soap and water.		
2	Slagmaking in IF75-furnace	Safia		Full protective gear, warm protecting silver jacket and CO-sensor, do not stick things in the furnace to avoid getting power, always at least two people working together.		
3	Characterization in EPMA	Safia		Cast samples in a fume hood. Wear plastic gloves and protective glasses during handling.		
4	Equilibrium experiments with Si and CaO-Al ₂ O ₃ slags in the blue furnace	Safia		Don't leave the furnace as long as the power is on, use a dust mask when cleaning the furnace and during handling of the powder.		

 NTNU HMS/KS	<h2 style="margin: 0;">Risk assessment</h2>	Prepared by	Nummer	Date	
		HSE section	HMSRV2603	04.02.2011	
		Approved by	Page	Replaces	
		The Rector		09.02.2010	

Unit: (Institute) IMA Date: 28.01.2020

Line manager: Jostein Mårdalen

Participants in the identification process (incl. function): Gabriella Tranell, Mertol Gökema, Safia Hassan
(supervisor, student, co-supervisor, others)

Risk assessment of: 1) Slag making with CaO-Al₂O₃ in IF75 furnace. 2) In the blue furnace, equilibria experiments between Si and CaO-Al₂O₃ slags. 3) Casting samples in epoxy for EPMA.

Signatures: Responsible supervisor: Gabriella Tranell, Mertol Gökema Student: Safia Hassan

ID nr.	Activity from the identification process form	Potential undesirable incident/strain	Likelihood: (1-5)	Consequence:			Risk value (human)	Comments/status Suggested measures
				Human (A-E)	Environment (A-E)	Economy/material (A-E)		
1	Remelting of silicon with the slag in the blue furnace	Inhale silicon particles or slag particles	3	C			C3	
2		Gas leakage	1	E			E1	
3		Warm metal astray	1	D			D1	
4		Water leakage	2	D			D2	
5		Hearing damage	1	C			C1	
6		Overheating and melting of the coils	1	E			E1	

ID nr.	Activity from the identification process form	Potential undesirable incident/strain	Likelihood: (1-5)	Consequence:			Risk value (human)	Comments/status Suggested measures
				Human (A-E)	Environment (A-E)	Economy/material (A-E)		
1	Mixing powders to make the slag	Inhale Al ₂ O ₃ /CaO particles	3	C			C3	
2	Slag-making in IF75-furnace	Hazardous exhaust gases (CO)	1	D			D1	
3		Warm slag astray	1	C			C1	

ID nr.	Activity from the identification process form	Potential undesirable incident/strain	Likelihood:	Consequence:				Risk value (human)	Comments/status Suggested measures
			(1-5)	Human (A-E)	Environment (A-E)	Economy/material (A-E)			
1	Characterization in EPMA								
2	Casting in epoxy	Irritating to eyes and skin. May cause sensitization by skin contact	2	B				B2	

Risk value = Likelihood (1, 2 ...) x consequence (A, B ...). Risk value A1 means very low risk. Risk value E5 means very large and serious risk

Likelihood		Consequence					
Value	Criteria	Grading		Human	Environment	Economy/material	
1	Minimal: Once every 50 year or less	E	Very critical	May produce fatality/ies	Very prolonged, non-reversible damage	Shutdown of work >1 year.	
2	Low: Once every 10 years or less	D	Critical	Permanent injury, may produce serious health damage/sickness	Prolonged damage. Long recovery time.	Shutdown of work 0.5-1 year.	
3	Medium: Once a year or less	C	Dangerous	Serious personal injury	Minor damage. Long recovery time	Shutdown of work < 1 month	
4	High: Once a month or less	B	Relatively safe	Injury that requires medical treatment	Minor damage. Short recovery time	Shutdown of work < 1week	
5	Very high: Once a week	A	Safe	Injury that requires first aid	Insignificant damage. Short recovery time	Shutdown of work < 1day	

MATRIX FOR RISK ASSESSMENT

CONSEQUENCE	Very critical	E1	E2	E3	E4	E5
	Critical	D1	D2	D3	D4	D5
	Dangerous	C1	C2	C3	C4	C5
	Relatively safe	B1	B2	B3	B4	B5
	Safe	A1	A2	A3	A4	A5
		Minimal	Low	Medium	High	Very high
		LIKELIHOOD				

Explanation of the colors used in the risk matrix.

Color	Description
Red	Unacceptable risk. Safety measures must be implemented.
Yellow	Measures to reduce risk shall be considered.
Green	Acceptable risk.