

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:** 28.01.2020

Line manager: Jostein Mårdalen

Participants in the identification process (incl. function): Inger Fygle (student), Dmitry Slizovskiy (responsible person), Ivar Andre Ødegård (responsible person) and Safia Hassan (student)
(supervisor, student, co-supervisor, others)

Short description of the main activity/main process: Slag making with CaO-TiO2 and CaO-SiO2-TiO2 in IF75 furnace, and remelting Al with the 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 (supervisor) and Mertol Gökelma (co-supt Student: Inger Fygle)

ID nr.	Activity/process	Responsible person	Existing documentation	Existing safety measures	Laws, regulations etc.	Comment
1	Weighing of powder used to make the slag	Inger Fygle		Gloves, fume hood, dust mask. Be careful when weighing the powder so it does not		
2	Slagmaking in IF75-furnace	Dmitry Slizovskiy		Full protection with jacket, shoes, glasses, helmet, pants, gloves, warm protecting silvercoat, CO-sensors and ventilation. Always two people working together, especially during the casting.		
3	Remelting of Al with the slags in the blue furnace	Ivar Andre Ødegård		Use earprotection when the furnace is on, do not leave the furnace as long as the power is on, use a dusk mask when cleaning the furnace and during handling of the powder		
4	Casting of samples	Berit Vinje Kramer		Cast the samples in the fume hood, use gloves, protecting glasses and lab-coat during the casting. Always keep the fume hood as closed as possible during the casting.		
5	Characterization of samples in SEM	Inger Fygle		Be careful when taking the samples out of the oven and putting them into the SEM-maskin.		
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NTNU	Risk assessment	Prepared by	Nummer	Date	
		HSE section	HMSRV2603	04.02.2011	
HMS /KS		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): Inger Fygle (student), Dmitry Slizovskiy (responsible person), Ivar Andre Ødegård (responsible person) and Safia Hassan (student)
(supervisor, student, co-supervisor, others)

Risk assessment of: slag making with CaO-TiO₂ and CaO-SiO₂-TiO₂ in IF75 furnace, and remelting Al with the slags in the blue furnace

Signatures: Responsible supervisor: Gabriella Tranell (supervisor) and Mertol Gökelma (co-supe Student: Inger Fygle)

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	Weighing of the powder in general	Can breath in the powder, get powder in eyes, get powder on clothes.	2	C			C2	Use of dust mask (IMPORTANT), use of gloves (but do not touch your eyes or clothes) and use of glasses. But, only use gloves if it is necessary. Fume hood.
2	Weighing of TiO ₂ -powder	Could cause cancer, irritates the skin and the eyes.	2	D			D2	Use of dust mask, jacket, pants, glasses, gloves, full protection. In case of getting powder in eyes or on your skin or in your mouth, rinse with water and contact the doctor if the symptoms keep on. In case of inhalation move out in fresh air and also contact the doctor if the symptoms dont stop.
3	Weighing of CaO-powder	Could irritate your skin and lungs. Can cause severe damage on your eyes.	2	D			D2	Use gloves, dust mask, jacket, pants, full protection. If contact with eyes: rinse with water for minimum a couple of minutes, if inhaling or getting in your mouth: contact a doctor or a poison center.
4	Weighing of SiO ₂ -powder	Could irritate your eyes and with inhaling over a long time it could cause silicosis.	2	D			D2	Use dust mask, eye protection and gloves. If it is in contact with eyes or skin: rinse with water for at least 15 minutes.
5	Painting of the crucible with boron nitride	Could cause irritation of eyes, skin and mouth.	1	C			C1	Use gloves and glasses when painting the crucible.
6	Slag-making in IF75	Hazardous exhaust gases (CO)	1	D			D1	Good ventilation system applied above the furnace, also CO sensors that calculate the amount of CO in the room.
7	Slag-making in IF75	"Explosion" of powder due to high heat.	1	D			D1	Use full protection during melting, also keep an eye on the temperature at all time and if you see movement of the crucible turn the furnace off imidiately. Also if you hear wierd noises turn the furnace off imidiately.

8	Slag-making in IF75	Loosing the grip of the crucible during casting.	1	D						Use full protection during melting and casting. Gloves, shoes, silvercoat and helmet. Also have a good and clear communication with your partner during the lifting of the crucible and during the pouring of the slag into the mould.
9	Casting the samples in epoxy	Epoxy is irritating to skin and eyes. Inhaling of epoxy can give an allergic reaction	1	B						Important to use gloves, glasses, lab-coat and do the casting inside a fume hood. Keep the fume hood as closed as possible.
10	Melting slag and Al in the blue furnace	Gas leakage from the gas bottle or from tubes, damage to hearing, inhaling of dust during cleaning of the furnace.	2	C						Always use ear protection when the power is on and always use a dusk mask during cleaning of the furnace.
11	Melting slag and Al in the blue furnace	Water leakage, if the alarm button for water leakage is blinking the furnace should be shut of immediately. This could cause the furnace to explode.	2	D						Always check for water in the furnace before turning the power on.

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	Acceptabel risk.