

SÅNN GJØR VI PÅ ELKEM TECHNOLOGY-LAB

This is how we do it at Elkem Technology LAB



Presentation

- Astrid Storesund, Laboratory engineer. Employee at Elkem Research / Solar Research/Technology lab since 1990

Elkem Technology
Chemical Lab
R & D lab



Our owners



- China National Chemical Corporation (ChemChina) is a large State-owned enterprise established in 2004
- Ranked 234th on the “Fortune Global 500” and China’s largest chemical company
- \$48 billion sales revenue in 2016
- 112 production and management companies
 - 9 overseas companies
 - 26 research institutes
- 137,500 employees globally



- China National Bluestar (Group) Corp is a subsidiary of ChemChina, established in 1984
- Leading company within
 - Advanced materials
 - Healthcare & Nutrition
 - Industrial Service
 - Basic Chemicals
- Bluestar has grown into one of China’s most successful chemical companies through constant innovations and M&A
- \$7.5 billion sales revenue in 2016

Elkem – en global aktør med hovedtyngde i Norge

114 års historie som teknologiselskap

Grunnlagt i 1904 av Sam Eyde

Eid av China National Bluestar siden 2011



**26 VERK PÅ
VERDENSBASIS**

Hovedkontor i Oslo



6 200

ANSATTE

på verdensbasis
1 500 i Norge



14,2 B NOK

Omsetning i 2016*

8 mrd i Norge

*15 MRD med nye verk i Norge og India

*15 BMDK incl. new assets in China and Nepal



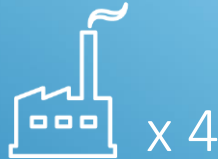
**400 ANSATTE I FORSKNING
OG UTVIKLING**

Globale forskning- og
utviklingsentre i Norge
og Lyon

Elkem AS – our **four business areas**

Silicon Materials

Global producer and provider of silicon, microsilica and specialty materials



Silicones

One of the foremost fully integrated silicones manufacturers in the world



Foundry Products

Leading producer of specialty-alloys for the foundry and steel industries

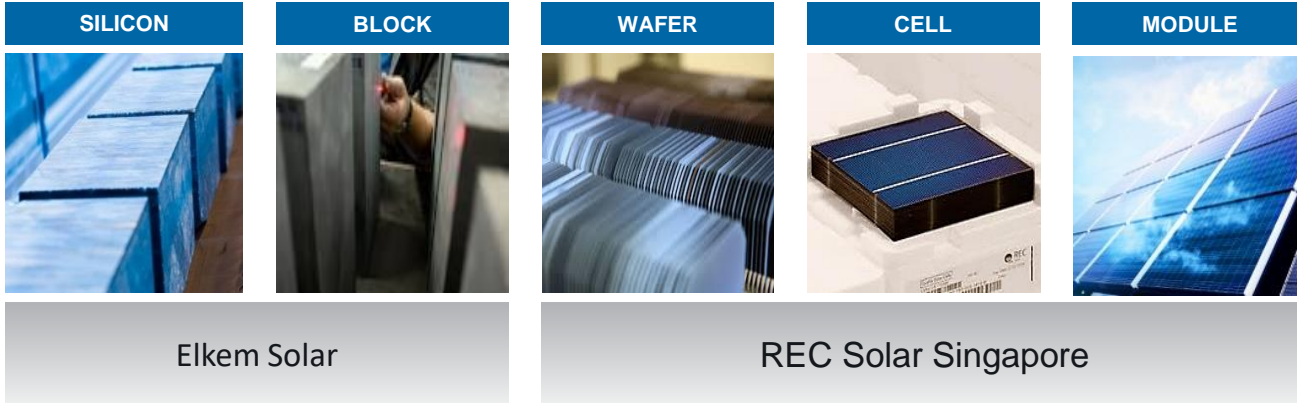


Carbon

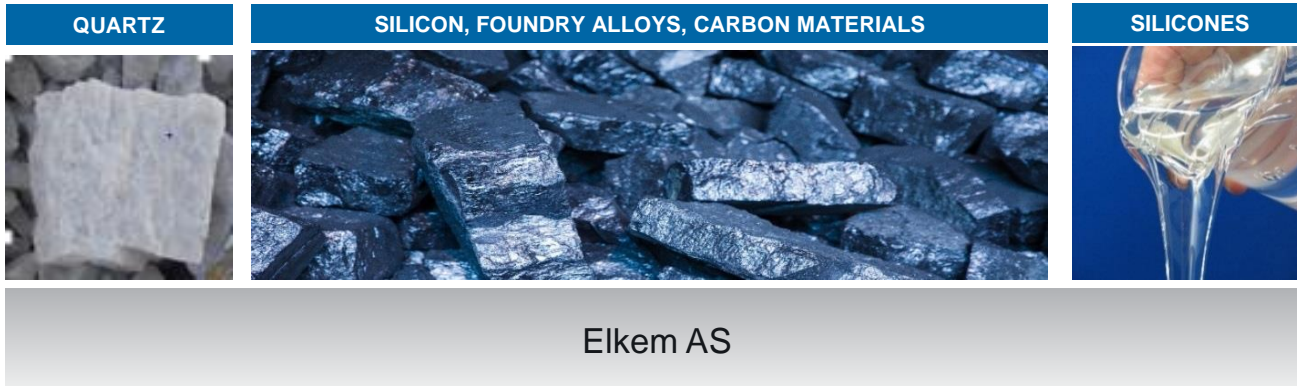
Leading producer of electrode paste and other carbon products



The Elkem Group: two integrated value chains



Revenue: 6,6 BNOK
Employees: 2250



Revenue: 14,5 BNOK
Employees: 3800

Fiskaa plant,
Kristiansand,
Norway



Elkem Technology – Laboratories

Mission

- High quality services within material analysis and characterization to support Elkem' business strategies
- Technical support to Plant and Divisions, Quality- and Laboratory managers
- A driving force for standardization at Elkem laboratories

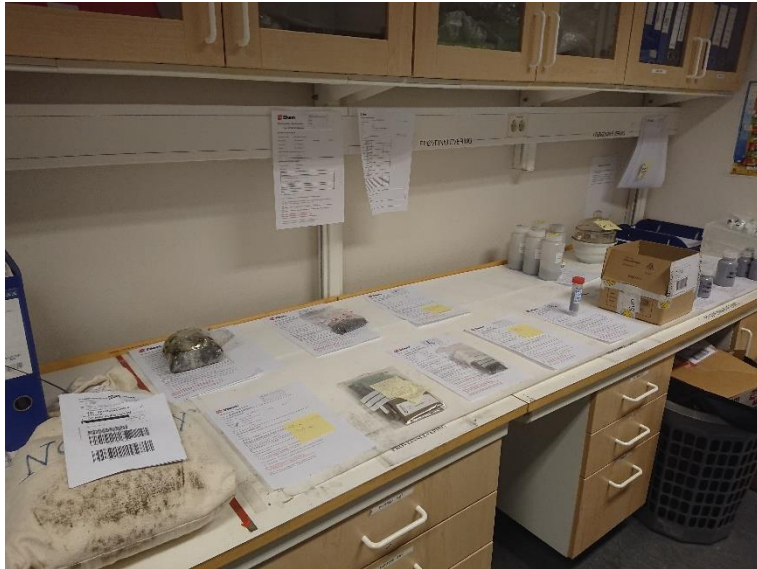


20 specialists covering
the fields of

- **Chemical Analysis - inorganic materials ****
- **Development of analytical applications**
- Statistical evaluation of analytical methods
- **Material Characterisation ***
- Quantitative image analysis

Samples for analysis

- COAL, COKE AND BIO- CARBON
- QUARTZ AND SILICON
- FERROALLOYS
- UNKNOWN / NEW MATERIALS



Sample preparation



← Muffel furnaces



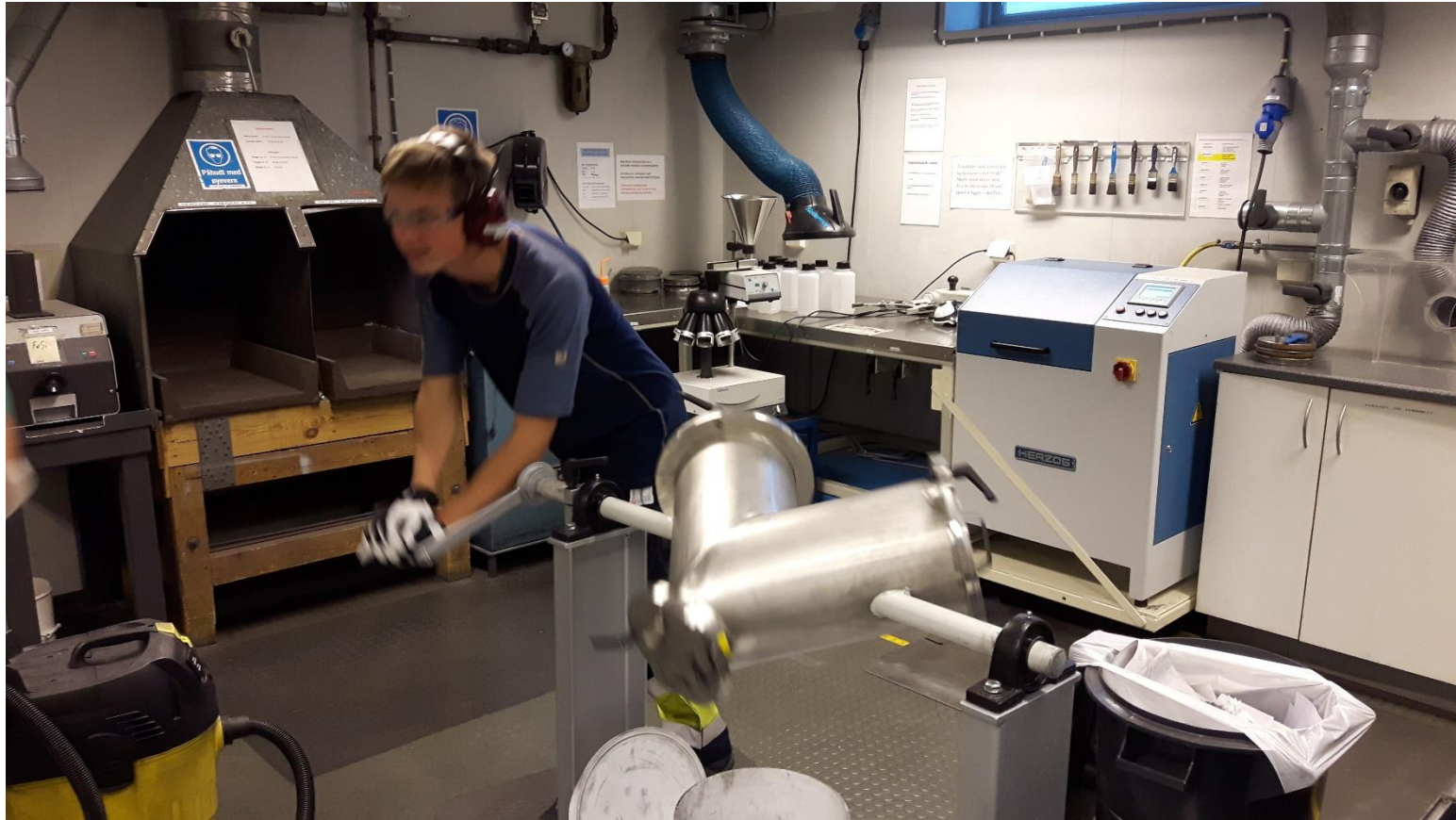
Sledge hammer



Woodchips cutter

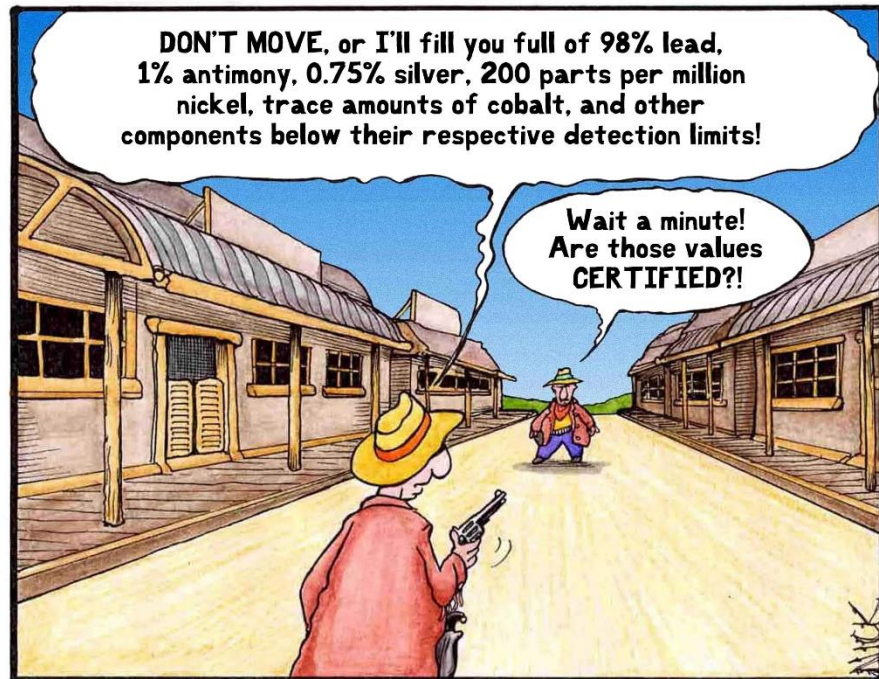
Sample splitters

Crushing, grinding and homogenisation



Production of control and calibration samples

Tested on XRF, ICP and AAS
and at external laboratories.



Milling

Automatic mill →

Adjustable bench, half automatic mill ↓



Milling /contamination

Different qualities of metals, slag and quarts for cleaning of milling chambers and crushers



Diverse: ulike materialer. **NB stor fare for krysskontaminering.**



Slagg: Nedmaling av slagg

Malefat i agat



Agat: Nedmaling av kvarts, kornstørrelse < 0,5 mm. **NB hastighet 1.**

Bruksområde på malefatene

Malefat i Wolframcarbide (WC)



Si 90+: Kun til Silisium.



Sorte: Karbonmaterialer (nedmaling av kull og koks osv.)



Rød: Ulike Si og FeSi legeringer. **NB stor fare for krysskontaminering.**



Gull: FSM

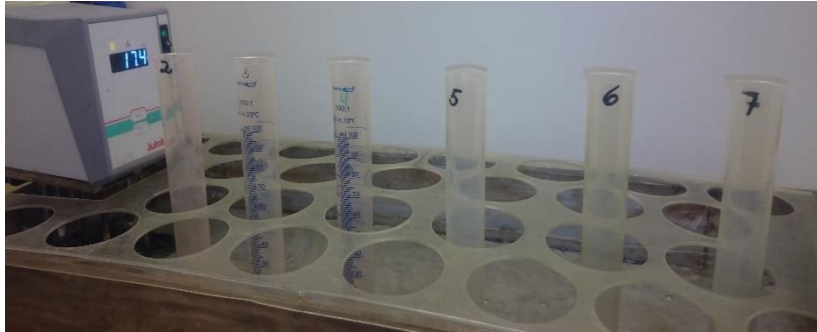
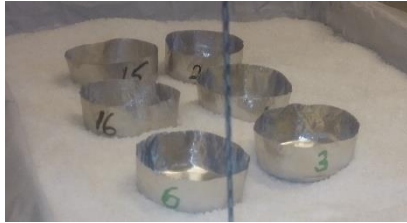


Materials: Låner vi til kvarts.

Malefat i stål

Acid digestion

Laboratory facilities suited for preparation and acid digestion of inorganic materials

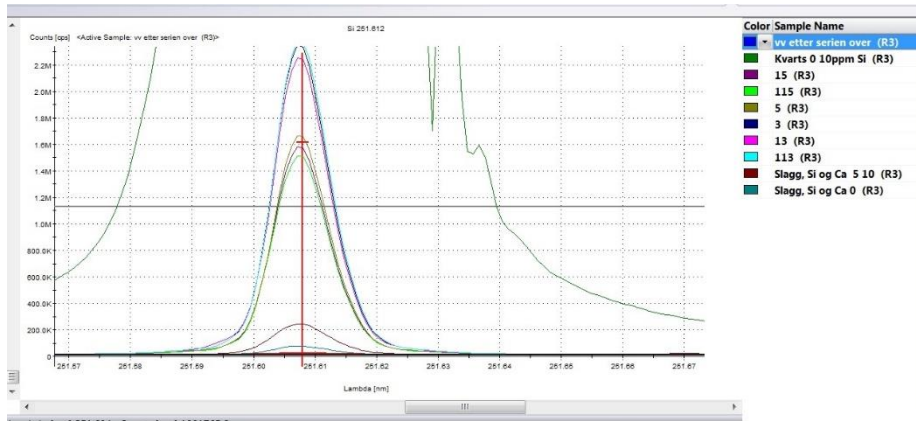
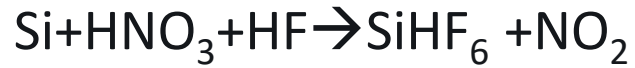


Si / SiO₂ digested in HNO₃ + HF



Action:

Dissolution of metallic Si in HNO_3 with HF.



LIMS (Wilab), method control and calibration samples

Resultatinnlegg (1) pr. prøve Alle prøver, Endre AST

Arkiv Felt Rapporter Vedlikehold Formularer Hjelp

Wilab nr: Ansvarlig:

Oppdrags nr: Prøvetekst:

Oppdragsgiver:

Avgjørelse
 Godkjent
 Ikke godkjent

ID:
 Dato:

Metodepakke:

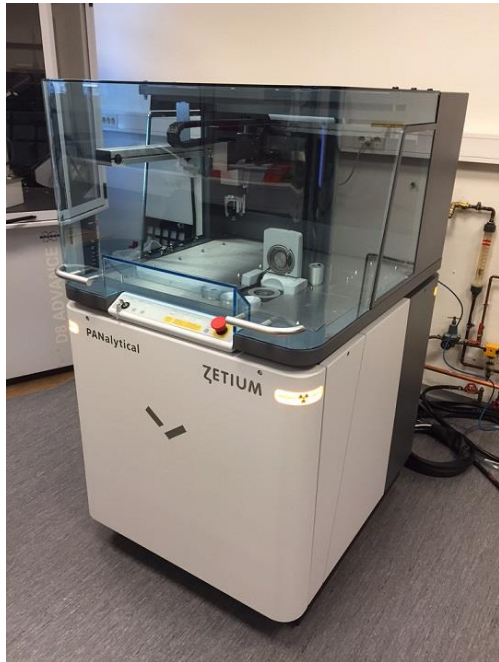
Analyse	Resultat	Metode	Enhet	Måleusikkerhet	Dato	ID	A	S
Al-ppm-MP	0.070%		ppm		100915	AST	X	
Ca-ppm-MP	0.010%		ppm		100915	AST	X	
Cr-ppm-MP	0.57/0.74		ppm		160915	AST	X	
Cu-ppm-MP	1.5/1.3		ppm		160915	AST	X	
Fe-ppm-MP	0.027/2.60		ppm		160915	AST	X	
Mn-ppm-MP	1.7		ppm		100915	AST	X	
Ni-ppm-MP	0.55/0.49		ppm		160915	AST	X	
Ti-ppm-MP	16		ppm		100915	AST	X	
V-ppm-MP	0.44		ppm		100915	AST	X	
P-ppm-MP	28		ppm		100915	AST	X	
Mg-ppm-MP	1.6/1.1		ppm		160915	AST	X	
Ga-ppm-MP	<1.0		ppm		100915	AST	X	
B-ppm-MP	25		ppm		160915	AST	X	
Na-%-AAS	<3ppm		%		220915	AST	X	
K-%-AAS	<3ppm		%		220915	AST	X	
Zn-%-AAS	0.37ppm		%		160915	AST	X	
Ba-%-AAS	<3ppm		%		220915	AST	X	
Li-ppm	<1		ppm		220915	AST	X	
Ce-ppm	<3		ppm		220915	AST	X	
PbD-ppm-AA	.		ppm		160915	AST	X	
Bi-ppm-AA	<3		ppm		220915	AST	X	
Mo-ppm-AA	0.13		ppm		160915	AST	X	
Y-%	xf		%		220915	AST	X	
Si-ppm-AA	<3		ppm		220915	AST	X	
Str-ppm-x	xf		ppm		220915	AST	X	
As-ppm-ICP	<0.1		ppm		160915	AST	X	
Cd-com-AA	<0.5		com		160915	AST	X	

Rapportkommentar...
 Innleggning "N..."



Instrument Park

XRF / XRD Applications: Elemental analysis in silicon, ferrosilicon, microsilica, cast iron, ash composition, FSM,



← PANalytical Zetium XRF (2015)

PANalytical PW 2404 XRF (1998) ↓



Bruker D8 Advanced XRD (2008) ↓
X-ray crystallography



Instrument Park



Agilent 6890 Series (1999) GC-MS
PAH in environmental samples



Extrel Max 300IG 2 units
(2006/2008) Process MS
On-line gas analysis

Thermo iSpark 8860 (2013) →
Elemental analysis of cast iron and
steel from production,
R&D and samples from customers



Instrument Park

Combustion analysis:

Carbon / Sulfur:

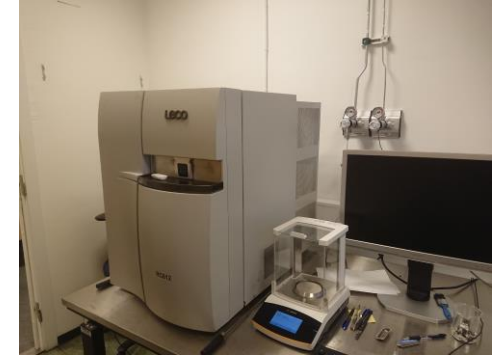
Analysis of solid samples.



LECO C-200 (2005)



Eltra CS 2000 (2004)



LECO RC 612 (2015)

C, S, O, N in reduction materials, silicon and ferro alloys
Total carbon in carbon products
Organic carbon in solid wastes and deposits

Nitrogen / Oxygen:

Analysis of solid samples. Material analysed by nitrogen/oxygen instrument: raw materials, silicon, ferrosilicon, cast iron, ferro silicon mangan (FSM),



LECO TCH 600 (2003)



LECO ON 836 (2012)

Instrument Park ICP/AAS

Typical measurements:
Minor and trace elements in quartz ,silicon,
ferro alloys, and waste samples.

VARIAN LIBERTY (1997)



PERKIN ELMER ELAN DRC 2 (2004)

ICP-MS



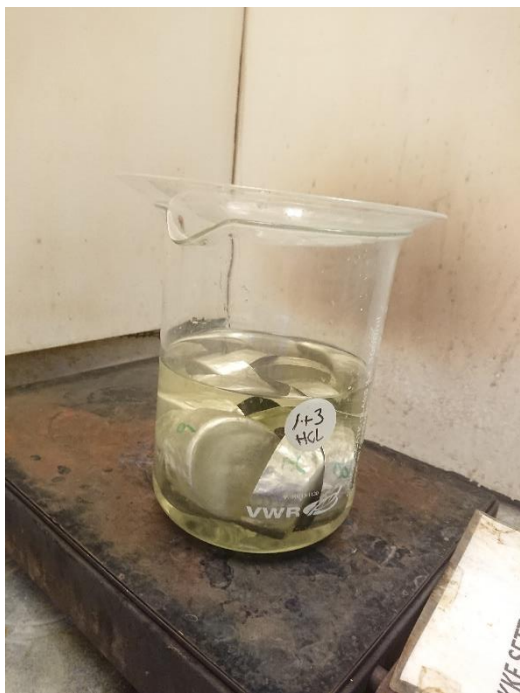
SPECTRO ARCOS (2008)



VARIAN AA 280 FS AAS (2008)



Use of concentrated and warm acids - EHS



Boiling Pt-crucibels in 1+3 HCl

Elkem Technology
Kjemisk Analyselab

PVU ved arbeid med syre

VERNEBRILLER: Påbudt.

HELDEKKENDE BEKLEDNING:
Påbudt med heldekkende bekledding ved syrearbeid. Arbeidstøy og hansker skal dekke all hud på armer. Valgfritt med jakke, frakk, genser eller mansjetter.

BUKSER MED VÆSKEBARRIERE:
Påbudt ved alt arbeid med syrer.

SKO: Påbudt med heldekkende sko.

HANSKER:
Påbudt ved alt arbeid med syrer.

PLAST/GUMMI FORKLEDE:
Påbudt ved påfylling av konsentrerte syrer, ved syre/base oppløsning av prøver og ved håndtering av varme begerglass til platinakoking.

VISIR:
Alt arbeid med konsentrerte syrer/baser. Håndtering av beger med varm syre ved koking av Pt-skåler.

Kristiansand, November 2013

Bruksområde for engangshansker



Shieldskin nitril, røde hansker.

Bruksområde: Kjemikaliehåndtering
Tabellen viser antall minutter hanskene motstår våre mest brukte syrer.

Syre, kons %	Minutt
HCl, 37 %	480
H2O2, 30 %	480
HF, 48 %	168
HNO3, 70 %	122
H2SO4, >95 %	57



NeoTouch neopren, grønne hansker.

Bruksområde: Kjemikaliehåndtering
Tabellen viser antall minutter hanskene motstår våre mest brukte syrer.

Syre, kons %	Minutt
HCl, 37 %	101
H2O2, 30 %	480
HF, 48 %	29
HNO3, 70 %	29
H2SO4, >95 %	7



Shieldskin nitril, oransje hansker.

Bruksområde: Organiske løsemidler



Vinyl, gjennomsiktige hansker.

Bruksområde: Laboratoriearbeid som ikke involverer kjemikalier.

EHS at the lab

Emergency shower and eye shower →

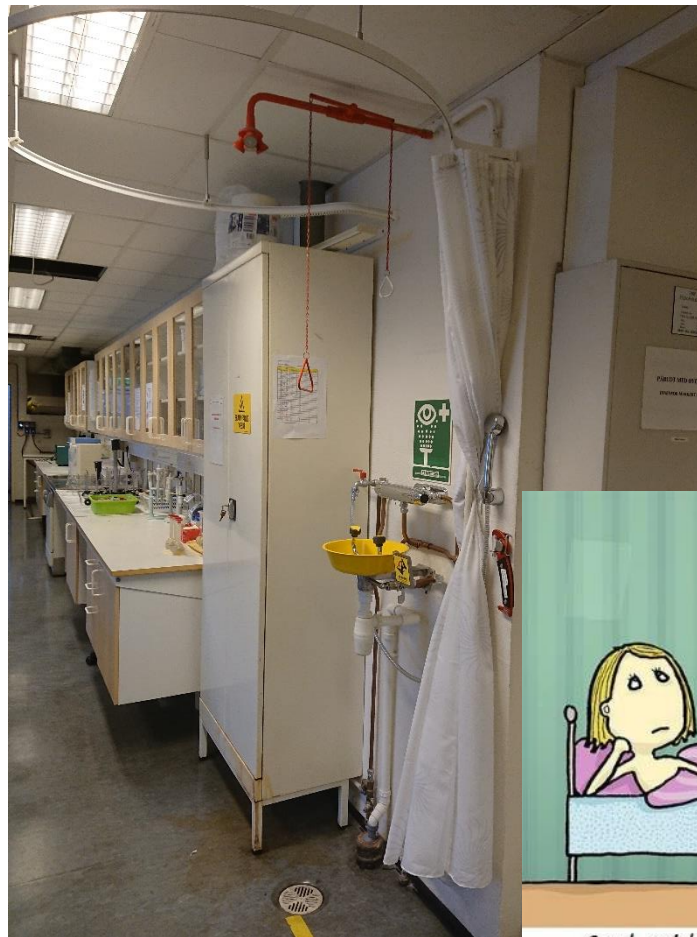
Note - First aid closet

Førstehjelps skap

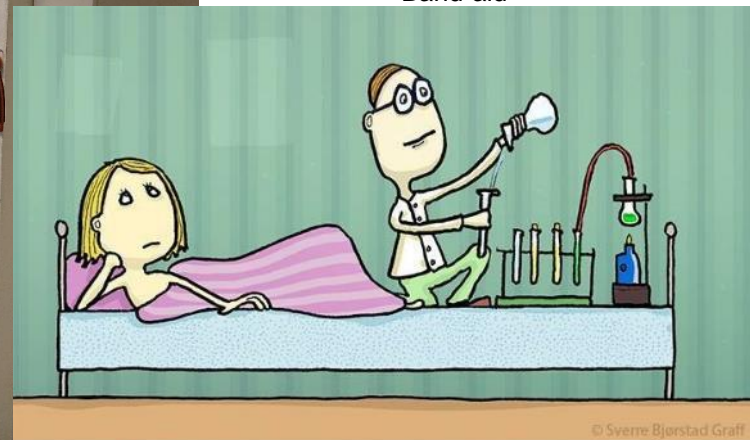
Innhold:

- HF Antidote gel til bruk ved HF søl på hud.
- Ekstra øyeskyll(pH nøytral)
- Gummihansker
- Kuttsikre hansker
- Støvmaske
- Burnshield gelmaske
- Redningsfolie
- Ispose
- Sperreteip
- Støvdress
- Plastforkle
- Spillkit til oppsamling av mindre mengder syresøl
- HF info mappe til Ambulanse/ Lege.

Sjekket: Sign *5/1-14* dato *Rita Amundsen*



Gas mask
First aid kit
Band-aid



Carl said he wanted to experiment more in bed

Takk for meg / Thank you

