

Arbeitsbereich:
IMT

Arbeitsplätze: Alle Räume
Tätigkeiten: Arbeiten in Laboratorien



Verantwortlicher:
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INHALT

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ERSTELLUNG UND ANHÄNGE

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ZUSÄTZLICHE INFORMATIONEN

Zusätzlich zu dieser Laborordnung wurden und werden kontinuierlich weitere Betriebsanweisungen unter Berücksichtigung der eingesetzten Gefahrstoffe und Arbeitsmittel erstellt. Diese Betriebsanweisungen ergänzen die Laborordnung und sind auf dem IMT-Laufwerk J im Ordner „Public“ zu finden.

Die Laborordnung wird an einem zentralen Ort bekannt gemacht (Laufwerk J:\Public). Sie wird allen betroffenen Beschäftigten erstmalig vor Arbeitsaufnahme ausgehändigt und dabei auf den Speicherort verwiesen. Die Beschäftigten sind über den Inhalt der Laborordnung erstmalig und wiederholend mündlich mindestens 1x innerhalb von 12 Monaten zu unterweisen. Dadurch werden die Beschäftigten nicht davon entbunden, sich selbständig laufend über Sicherheitsvorschriften und Schutzmaßnahmen zu informieren.

Neben der Laborordnung gelten uneingeschränkt alle gesetzlichen Regelungen zum Chemikalierecht, (z. B. das Gesetz zum Schutz vor gefährlichen Stoffen (Chemikaliengesetz (ChemG)), die Verordnung zum Schutz vor Gefahrstoffen (GefStoffV), das entsprechende Technische Regelwerk (TRGS), das Regelwerk des Unfallversicherungsträgers „Unfallkasse Baden-Württemberg“ (UKBW) und der Deutschen Gesetzlichen Unfallversicherung (DGUV, z. B. „Sicheres Arbeiten in Laboratorien“ (DGUV Information 213-850 oder -851), „Sicherheit im chemischen Hochschulpraktikum“ (DGUV Information 213-026), „Tätigkeiten mit Gefahrstoffen in Hochschulen“ (DGUV Information 213-039)) sowie gesetzliche Regelungen aus anderen Rechtsbereichen, z. B. dem Betriebssicherheitsrecht, dem Gentechnikrecht, der Biologische Sicherheit oder dem Strahlenschutzrecht.

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ISSUE and APPENDICES

Author:	Jürgen Benz (Tel. 0721 608 26245)
Valid from:	01.12.2016 until further notice
Responsible for the laboratories:	see document "Laborverantwortliche_IMT.pdf" at file server J:\Public
Date and signatures:	archived at IMT secretariat (B. 310; Room 354)
Responsibilities at IMT:	see Appendix 1

ADDITIONAL INFORMATION

In addition to the present laboratory rules, further operating instructions were and continue to be set up under consideration of the hazardous substances and work materials used (for details, see TRGS 555 "Betriebsanweisung und Information der Beschäftigten" (Operating instructions and information of employees). Those operating instructions shall complement the present laboratory rules, and may be found in the 'Public' folder of the IMT J: drive.

The laboratory rules are published in a central location (J:\Public). The present rules shall be handed over to all employees prior to the start of their work. The employees shall be informed about the contents of the present laboratory rules for the first time when starting their work. These oral instruction sessions shall be repeated regularly. However, this shall not release the employees from their obligation to inform themselves continuously about safety regulations and protection measures. By signature, the employees shall confirm receipt of one copy of the laboratory rules and the fact that they have read, were instructed about, and understood the contents.

Apart from the present laboratory rules, all legal regulations relating to chemicals (e.g. the Act for Protection against Hazardous Substances (Chemicals Act), the Ordinance for Protection against Hazardous Substances (Hazardous Substances Ordinance, GefStoffV), the corresponding technical regulations (TRGS), the Regulations of the Accidents Insurance company "Unfallkasse Baden-Württemberg" (UKBW) and of the German Legal Accident Insurance Company (DGUV), e.g. "Sicheres Arbeiten in Laboratorien" (Safe work at laboratories, DGUV information 213-850 or -851), "Sicherheit im chemischen Hochschulpraktikum" (Safety during university traineeship programs in chemistry, DGUV information 213-026), "Tätigkeiten mit Gefahrstoffen in Hochschulen" (Work with hazardous substances at universities, DGUV information 213-039)) and legal regulations for other areas, e.g. industrial safety regulations, genetic engineering legislation, biological safety and radiation protection legislation, shall apply.

Note: The English version of this document is provided for convenience only. The German version of this document ("Laborordnung") is binding.

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GENERAL OPERATING INSTRUCTIONS - “LABORATORY RULES“ -

according to Art. 14 GefStoffV, as outlined in TRGS 526 and DGUV information 213-850,
of the

Institute:	Institute of Microstructure Technology (IMT)
Unit/group:	All working groups of IMT
Area of application:	Buildings 301, 307, 310, and 321.
Hazardous substance commissioner:	Klaus Bade, Nicole Barié, Markus Guttmann, Kerstin Länge
Safety commissioner:	Dieter Gutjahr
Operation commissioner:	Heinz Dinglireiter (B. 301, 307, 310) / Jürgen Benz (B. 321)
Author:	Jürgen Benz (Tel. 0721 608 26245)
Valid from:	01.12.2016 until further notice
Responsible for the laboratories:	see Appendix 1
Date and signatures:	see Appendix 2
Responsibilities at IMT:	see Appendix 3

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1. GENERAL

- A responsible person shall be appointed by the head of the institute for each laboratory. The name of the person responsible for the laboratory shall be displayed in the entrance areas. The responsible person shall be informed by the laboratory staff about all activities in his/her area of responsibility and in particular about work on experiments or installations on weekends or overnight.
- It is forbidden to unauthorized persons to enter the laboratories. This shall be indicated by the corresponding information signs. Work of external staff shall only be permitted, if either existing hazards have been eliminated before or suitable protection measures and ways of conduct have been defined, and the external staff has been instructed accordingly. External staff shall be e.g. employees of other companies, but also KIT employees from other areas, who do not work at the laboratory, and visitors.
- Pregnant women and nursing mothers shall avoid contact with certain hazardous substances. Work at laboratories, where these hazardous substances are handled, shall also be excluded, if the respective female employee does not handle these hazardous substances herself. Even if they wish, female employees must not be employed when employment of pregnant women, nursing mothers, and women of childbearing age is restricted. Further details are outlined in the Mutterschutzgesetz (Maternity Protection Act) and the Verordnung zum Schutz der Mütter am Arbeitsplatz (Ordinance for the Protection of Mothers at the Workplace).
- Adolescents aged between 15 and 18 (e.g. trainees) shall only be allowed to work at the laboratories under supervision by expert staff. Expert staff shall be staff having the corresponding professional qualification and several years of laboratory experience in handling hazardous substances, staff currently executing a corresponding professional activity, and staff having participated in the corresponding trainings.
- Adolescents under the age of 15 shall not be allowed to handle hazardous substances, unless these activities are required to reach the training objective and carried out under supervision.
- It is forbidden to eat, drink, smoke, and snuff at all laboratories.
- For every laboratory (laboratories of the same type may be combined), a risk assessment shall be made and kept available in writing or as a computerized version for consultation. The risk assessment shall be reviewed regularly and updated in case of changes of the hazard situation. The revision or control of the efficiency of defined measures shall be documented in writing (see also TRGS 400).
- Prior to the start of new work or in case of major changes of existing work processes, the hazards shall be determined and protection measures defined by the laboratory manager.
- Employees ordered to execute experiments may leave the workplace during the experiment only, if permanent supervision is not required or supervision is continued by another qualified person.
- Unattended experiments and installations shall be labeled. The name and phone number of the responsible person, the experimental setup or hazardous substances used, and the resulting hazards at least shall be indicated on the label. It shall be ensured that other necessary laboratory work can be carried out parallel to the unattended experiments.

- Laboratory doors shall be kept closed and shall not be blocked.
- Laboratory clothes and street clothes shall be kept separately. Street clothes must not be taken off in the laboratory.
- Writing work that does not require to stay at the laboratory shall be carried out outside of the laboratory.
- All equipment and other devices shall be checked for a proper and safe state of operation prior to use. Obviously damaged devices shall not be used.
- Pressurized reaction vessels shall be licensed for the purpose of use. They shall be subject to the Betriebssicherheitsverordnung (Operation Safety Ordinance) and inspected regularly.
- Cooling devices, dewar vessels, and vacuum devices (e.g. exsiccators) shall be enclosed by an adhesive foil, if they do not have any protective housing.
- Everybody shall be responsible for safety at the laboratory. If a deficiency is noticed, it shall be eliminated or notified immediately and elimination shall be arranged.
- Prior to the first start of work, it shall be checked whether a preventative examination by the company doctor is required or to be offered. If yes, such an examination shall be arranged.
- Drunk work or work under the influence of other drugs or substances impairing consciousness shall be forbidden.

2. WORKING TIMES

Main opening times (e.g. Monday – Friday, 8 am to 6 pm, or core working time) and special opening times (e.g. Monday - Friday, 6 pm to 8 am, Saturday, Sunday or outside of core working time,) shall be distinguished. During main opening times, work of any type may be executed without any restrictions. Hence, it shall be ensured that sufficient staff is present for emergencies (first-aiders, fire protection assistants, radiation protection commissioners, etc.). Execution of hazardous work (see section 6) at times other than the main opening times shall require a permit in writing by the responsible department and laboratory manager. The latter shall be obliged to ensure that hazardous work is not executed alone. By agreement with colleagues, it shall be ensured that at least two qualified persons are present to supervise each other at regular intervals. If necessary, registration in a control book at a central point shall be required. Further details regarding correct working protocols can be found in the individual laboratory instructions.

3. CLOTHING, (PERSONAL) PROTECTION EQUIPMENT

- When working with hazardous substances, appropriate work and/or protective clothes shall be worn. Staff shall be obliged to wear
 - safety glasses (goggles) with sufficient side protection and top coverage of the eye area, if possible,

- a closed, long laboratory coat with long, tight-fitting arms, and the share of cotton of the fabric being at least 35%, and
 - sturdy, closed, and safe shoes
- at all times.

Long trousers must be worn while working in the laboratory, preferably those with a high cotton content. Short trousers and skirts are not to be worn while working in the laboratory.

The above measures related to appropriate clothing also apply when working in the IMT cleanroom.

Any additionally required special protective clothing / equipment is listed in the operating instructions relating to substances, work materials, and special devices.

The institute leader shall be responsible for making available the required personal safety equipment and for its use by his staff.

- Wearers of correction glasses shall also wear safety glasses (either with cut-in lenses or over-glasses with side protection).
- The laboratory coat must not be worn at places, which may also be accessed by persons, who do not handle hazardous substances (office, kitchen, canteen, cafeteria, refectory, lecture hall, library, washing rooms, etc.).
- In case of activities associated with special hazards for the hands, e.g. when handling certain hazardous substances (caustic, corrosive, irritating, sensitizing, etc.), use of suitable gloves shall be required. The glove material shall be chosen depending on the purpose of use. As a rule, garden and household gloves are not suitable. Disposable gloves shall be suited for a few uses only (time until damage in case of contact with hazardous substances mostly is < 10 minutes).
- If there is a risk of cutting injuries, cut-proof protective gloves shall be made available and used when working with glass components.
- When working with very cold liquids (e.g. cryogenic nitrogen), suitable insulating gloves shall be made available and used.
- The gloves shall be checked for damage prior to each use. Damaged gloves must not be used.
- Gloves shall not be worn outside of the laboratory. They shall be taken off when using phones, opening room and corridor doors and windows as well as when using computers/office material, etc.

4. ORDERLINESS AND CLEANLINESS OF THE WORKPLACE

- The own workplace and all shared facilities shall be kept in an orderly state. The own laboratory place shall be tidied up regularly (at least once a week).
- Escape and emergency routes and passages shall be kept free.

- At least once a year, it shall be checked whether chemicals have to remain at the laboratory or to be removed or disposed of, if necessary (the communicated correct chemical disposal protocols must be followed). The database of hazardous substances (to be administrated via the ChemA program) shall be updated accordingly. Every year until June 30, an inventory shall be made and documented in ChemA.

5. SAFETY INSTALLATIONS

Every person working at a laboratory shall inform himself / herself about locations and functions of safety installations as well as about escape routes, fire alarms, and alarm plans. Escape and rescue paths shall be kept free all the time. Fire-extinguishing substances, emergency showers, and first-aid installations must not be blocked.

- Two types of fire extinguishers are available at all laboratories:
 - Carbon dioxide extinguishers at every laboratory;
 - Water/foam or powder extinguishers on the corridors.

Immediately after use, fire extinguishers shall be handed in, e.g. to the Fire Department, for refilling, exchanged, and returned to their places refilled. In the meantime, alternative fire protection measures shall be defined and implemented.

- First-aid boxes shall be provided at central locations and checked for completeness and service lives regularly. The first-aid log shall be kept electronically (<http://www.kiss.kit.edu/102.php>). Persons responsible for first-aid boxes shall be appointed, e.g. the first-aiders. Even small injuries that do not require any examination by the company doctor or visit of a hospital shall be documented in the first-aid log for insurance reasons (in case of unexpected consequential damage).
- Body emergency showers shall be supplied with drinking water, if possible, and installed at the laboratory exit. Their water flow rate shall be at least 30 l/min. They shall be reached within 5 seconds from every place in the laboratory.
- Emergency showers for the eyes shall be supplied with water of drinking water quality. They shall be installed, such that they can be reached directly from every workplace. The water flow rate shall be at least 6 l/min at every outlet. They shall be reached within 5 seconds from every place in the laboratory.
- Body emergency showers and emergency showers for the eyes shall be inspected every month for proper functioning by the laboratory staff. This inspection shall be documented. In areas without running water, a sufficient number of eyewash bottles shall be provided. The contents of the eyewash bottles (drinking water) shall be exchanged every month at least.
- Protective respirators shall be permitted for special work (e.g. with toxic gases) only. The breathing connections / masks shall be cleaned after each use, filters shall be screwed off and closed again on both sides. Time and duration of use shall be documented. When the service life of the filters expires, these shall be exchanged immediately.
- Prior to the use of protective respirators as personal protection equipment, an examination shall be offered by the company doctor or a fitness examination and an instruction shall be required. DGUV rule 112-190 shall be observed.

- Laboratory staff must regularly take a picture of existing safety equipment to document the condition and usability.

6. DANGEROUS WORK

Dangerous work shall be all activities using explosive, highly ignitable, easily inflammable, inflammable, carcinogenic, mutagenic, toxic for reproduction, dangerous to life, (acutely) toxic or caustic substances or activities with hazardous systems (under vacuum or pressure, Carius tubes and autoclaves, pressurized gases and gas cylinders, open flames or hot air fans on a high level, hydrations, ozonolysis, etc.).

- Dangerous work must not be performed alone (see the IMT operating instructions regarding working alone).
- Dangerous work shall always be performed under special protection measures (under hoods, behind glass shields, in special rooms, etc.). Please review the relevant material safety data sheets and IMT operating instructions prior to use.
- In case of any dangerous work, it shall be ensured that the staff members executing it are informed about all potential hazards and have been instructed about the corresponding emergency measures.

7. BEHAVIOR IN CASE OF HAZARDOUS SITUATIONS

Whenever hazardous situations (e.g. release of gases and vapors, leaks of hazardous liquids, fires) occur, observe the following rules:

- STAY CALM
- TAKE CARE OF YOUR OWN SAFETY FIRST WHEN PROVIDING HELP
- Inform the emergency control center (phone 3333, externally via 0721 608-3333)

After this, take the following measures:

- Warn endangered persons.
- If possible, rescue helpless persons and get them to safety.
- Follow the indicated escape routes.
- Stop endangered or endangering experiments, if possible, and bring the systems into a safe state of operation (if possible).
- Switch off gas and power supply.
- Let the cooling water of systems continue to run.
- In the case of fire, close doors and windows, try to extinguish the fire with the existing fire-extinguishing agents (e.g. fire extinguisher).
- After eye or skin contact with chemicals, wash with much water (e.g. by using the body emergency and / or eye emergency shower).
- If necessary, take first-aid measures.
- Inform the responsible staff:

- Laboratory manager
see notice board or the list found in J:\Public\Laborverantwortliche_IMT.pdf
 - First-aiders
see notice board or the list found in J:\Public\Erst_und_Brandschutzhelfer_IMT.pdf.
 - Safety commissioner Phone: 22856 (D. Gutjahr)
 - Emergency control center Phone: 24148 (H. Dinglreiter), 26245 (J. Benz)
 - If necessary, fire department Phone: 3333 (via every telephone)
 - If necessary, police Phone: 3333 (via every telephone)
 - If necessary, company doctor/ emergency doctor Phone: 3333 (via every telephone)
- In case of major accidents, make the Emergency Control Center inform the responsible Safety Officer.
 - In case of personal injuries, call the company doctor / emergency doctor. If a visit of a hospital is required, provide the emergency staff with the corresponding operating instruction, safety sheet according to REACH ordinance or other material information.
 - Arrange for external rescue forces being shown the access paths.

8. NIGHT WORK

Chemical experiments that have to be continued overnight for special reasons shall only be executed in accordingly secured night rooms envisaged for this purpose (with smoke or heat alarms, water monitors) using suitable devices (KPG stirrers with teflon tubes instead of glass tubes; gas and water hoses secured to prevent them from slipping off; heaters in safety collection basins, etc.). Continuation of such work at normal laboratories shall not be permitted.

Exceptions may be permitted, if the reactants are not burnable and stirred without the supply of heat, coolant or reactants at room temperature with a magnetic stirrer. This exceptional permit shall be granted by the responsible laboratory manager.

9. HANDLING OF HAZARDOUS SUBSTANCES

Substances, the harmlessness of which cannot be determined beyond all doubt, shall be handled analogously to hazardous substances.

Hazardous substances shall be substances and preparations / mixtures having one or several hazard characteristics according to the Chemikaliengesetz (ChemG) and, hence, requiring labeling according to the Gefahrstoffverordnung (Hazardous Substances Ordinance) or the CLP Ordinance or substances, the production and use of which gives rise to the formation or release of hazardous substances or preparations / mixtures. In addition, substances and preparations / mixtures that are known to potentially transmit pathogens shall be considered hazardous substances.

Labeling of packages of hazardous substances used at laboratories shall be subject to TRGS 201 “Einstufung und Kennzeichnung bei Tätigkeiten mit Gefahrstoffen“ (Classification and labeling when handling hazardous substances). Accordingly, simplified labeling shall be permitted, if this is the result of the risk assessment and if the corresponding operating instructions with instructions about hazards and protection measures are available. In case of simplified labeling,

- the name of the substance / mixture (with information on the constituents) and
- the hazard pictograms (hazard symbols and hazard designations according to the substance and preparation guidelines)





















of the main hazards caused by the physical / chemical, health-damaging, and environmentally hazardous effects of the substance or mixture shall be indicated at least.

In case of labeling according to the CLP Ordinance, there are no hazard designations. To compensate the reduced information content, a combination of hazard pictograms with phrases according to Annex 4 of DGUV information 213-850 is recommended for use as bottle label (see next page). Indication of the substance / mixture name (with information on the constituents) shall always be required.

At laboratories, hazards to health should always be described by up to two pictograms (acute and chronic effect), while physico-chemical hazards should be indicated by one pictogram (DGUV information 213-850, Annex 4).

When transporting or transferring hazardous substances to other persons or institutions, labeling according to the CLP Ordinance (Articles 17 – 22, CLP Ordinance) shall be required.

Overview of pictograms and phrases according to DGUV information 213-850:

			
Explosive	Danger to life	CMR substance cat. 1	Corrosive to skin/ metals
			
Extremely flammable	Toxic	CMR substance cat. 2	Irritant
			
Highly flammable	Harmful to health	Damages organs	Untested research substance
			<input type="checkbox"/> if inhaled <input type="checkbox"/> in contact with skin <input type="checkbox"/> if swallowed
Flammable	Narcotic	Can damage organs	
			Contact with water or acids liberates toxic gas
Pyrophoric	Allergenic if inhaled	Aspiration dangerous to life	Explosive when dry
		Can age dangerously	Reacts violently with water
Oxidising agent	Allergenic in contact with skin		

Use of the above pictogram / phrase combinations shall require observation of the following instructions for compaction of the information content of H-statements in phrases (excerpt from Annex 4 of DGUV information 213-850):

The information content of the H-statements was always compacted to phrases when further differentiation does not have any consequences for protection measures at the laboratory or a too detailed explanation would be required. In the latter case, it cannot be done without the additional information from the safety data sheet. Labeling only serves to initiate the process of obtaining information from the safety data sheet.

The following definitions were made:

- The characteristic “explosive” may be used as a collective characteristic, relevant additional information by the classification of H200ff, H240 is not obtained at the laboratory.
- For burnabilities and inflammation hazards, a distinction between “extremely flammable” and “(easily) flammable” is sufficient at the laboratory, burnability with water is considered to be an extreme flammability. Self-flammable substances are given a separate phrase.
- The H-statements concerning carcinogenic, mutagenic, and toxic for reproduction effects are reduced to the categories of “CMR substance cat. 1” and “CMR substance cat. 2”.
- The H-statements regarding specific target organ toxicity (STOT) are reduced to the two statements of “damages organs” for category 1 and “can damage organs” for category 2. At the laboratory, no distinction as to whether this may happen after a single or a repeated exposure is required. Category 3 STOT, respiratory tract irritation, is covered by the phrase “irritant”, the effect on the central nervous system is given the new phrase “narcotic”.
- “Caustic and irritating effects” on skin and eyes are not distinguished, as laboratory staff is permanently obliged to wear protective glasses.
- As the substances are disposed of properly in principle, a potential hazard to water does not have to be indicated at laboratories. If such information is needed, the pictogram “Umwelt” (GHS09, environment) can be used without any further phrase.
- The pictogram “exclamation mark” with the phrase “ozone-damaging” also is not needed. This hazard category only refers to a small number of substances, the use of which is subject to strict legal regulations. Laboratories handling these substances have to instruct their employees accordingly and separately.

Information on Exposure Paths:

An additional sticker is offered, on which the relevant exposure paths, e.g. in case of “acute toxicity” may be indicated by checking boxes.






In addition to pictogram / phrase combinations, the following phrases are offered for special hazard potentials:

- “Entwickelt giftige Gase mit Wasser oder Säure“ (Contact with water and acids liberates toxic gas) [note: A distinction regarding toxicity is not helpful in laboratory practice], “Im trockenen Zustand explosiv“ (Explosive when dry) [note: Information on the decreasing desensitization for packages on stock],
- “Reagiert heftig mit Wasser“ (Reacts violently with water),
- “Kann gefährlich altern“ (Can age dangerously) [note: May form peroxides and undergo other dangerous modifications during storage].








When characterizing hazardous substances by pictogram / phrase combinations, the following list of the Irish Health and Safety Authority (HSA) may be helpful (CLP poster 1 – Classification and Labelling, version of 04/2015; www.hsa.ie):
















Rev. 1, April 2015




Classification			Labelling			
Hazard-		Abbreviation of classification (without H set)	Pictogram, code*	Signal -word	Code* Warning of danger	
Class	Category				Code	Text
Explosives	Unstable explosive	Unst. Expl.	 GHS01	Danger	H200	Unstable explosive
	Division I.1	Expl. I.1			H201	Explosive; mass explosion hazard
	Division I.2	Expl. I.2			H202	Explosive; severe projection hazard
	Division I.3	Expl. I.3			H203	Explosive; fire, blast or projection hazard
	Division I.4	Expl. I.4	No Pictogram	Warning	H204	Fire or projection hazard
	Division I.5	Expl. I.5		Danger	H205	May mass explode in fire
	Division I.6	Expl. I.6		-	-	-
Flammable Gases	Category 1	Flam. Gas 1	 GHS02	Danger	H220	Extremely flammable gas
	Category 2	Flam. Gas 2	No Pictogram	Warning	H221	Flammable gas
	Category A	Chem. Unst. Gas A	No Pictogram	-	H230	May react explosively even in the absence of air
	Category B	Chem. Unst. Gas B	No Pictogram	-	H231	May react explosively even in the absence of air at elevated pressure and/or temperature
Aerosol	Category 1	Aerosol 1	 GHS02	Danger	H222	Extremely flammable aerosol
	Category 2	Aerosol 2		Warning	H223	Flammable aerosol
	Category 3	Aerosol 3	No Pictogram	Warning	H229	Pressurised container: May burst if heated
Oxidising Gases	Category 1	Ox. Gas 1	 GHS03	Danger	H270	May cause or intensify fire; oxidiser
Gases under Pressure ⁽¹⁾	Compressed gas	Press. Gas	 GHS04	Warning	H280	Contains gas under pressure; may explode if heated
	Liquefied gas				H281	Contains refrigerated gas; may cause cryogenic burns or injury.
	Refrigerated liquefied gas				H280	Contains gas under pressure; may explode if heated
	Dissolved gas				H280	Contains gas under pressure; may explode if heated

⁽¹⁾ = The hazard class "Gases under Pressure" is subdivided into "Groups" (not "Categories")

Classification			Labelling			
Class	Hazard- Category	Abbreviation of classification (without H set)	Pictogram, code*	Signal- word	Code* Warning of danger	
						Text
Flammable Liquids	Category 1	Flam. Liq. 1	 GHS02	Danger	H224	Extremely flammable liquid and vapour
	Category 2	Flam. Liq. 2			H225	Highly flammable liquid and vapour
	Category 3	Flam. Liq. 3		Warning	H226	Flammable liquid and vapour
Flammable Solids	Category 1	Flam. Sol. 1	GHS02	Danger	H228	Flammable solid
	Category 2	Flam. Sol. 2		Warning		
Self-reactive substances and mixtures ⁽²⁾	Type A	Self-react. A	 GHS01	Danger	H240	Heating may cause an explosion
		Org. Perox. A				
Organic Peroxides ⁽²⁾	Type B	Self-react. B	 GHS01 + GHS02		H241	Heating may cause a fire or explosion
		Org. Perox. B				
	Type C and D	Self-react. C&D	 GHS02	Danger	H242	Heating may cause a fire
		Org. Perox. C&D				
	Type E and F	Self-react. E&F		Warning		
		Org. Perox. E&F				
Type G	Self-react. G	No Pictogram	No Signal word	-	No hazard statement	
	Org. Perox. G					
⁽²⁾ = Two separate hazard classes have the same categories (and are therefore grouped).						
Pyrophoric Liquids	Category 1	Pyr. Liq. 1	 GHS02	Danger	H250	Catches fire spontaneously if exposed to air
Pyrophoric Solids	Category 1	Pyr. Sol. 1				
Self-heating substances and mixtures	Category 1	Self-heat. 1		GHS02	Danger	H251
	Category 2	Self-heat. 2	Warning		H252	Self-heating in large quantities; may catch fire
Substances or mixtures which in contact with water emit flammable gases	Category 1	Water-react. 1	GHS02	Danger	H260	In contact with water releases flammable gases which may ignite spontaneously
	Category 2	Water-react. 2				
	Category 3	Water-react. 3		Warning	H261	In contact with water releases flammable gases
Oxidising Liquids and solids	Category 1	Ox. Liq. 1	 GHS03	Danger	H271	May cause fire or explosion; strong oxidiser
		Ox. Sol. 1				
	Category 2	Ox. Liq. 2		Danger	H272	May intensify fire; oxidiser
		Ox. Sol. 2				
	Category 3	Ox. Liq. 3		Warning		
		Ox. Sol. 3				
Corrosive to metals	Category 1	Met. Corr. 1	 GHS05	Warning	H290	May be corrosive to metals

Classification			Labelling			
Hazard-		Abbreviation of classification (without H set)	Pictogram, code*	Signal-word	Code*	Warning of danger Text
Class	Category					
Acute Toxicity	Category 1	Acute Tox. 1	 GHS06	Danger	H300 H310 H330	Fatal if swallowed Fatal in contact with skin Fatal if inhaled
	Category 2	Acute Tox. 2			H301 H311 H331	Toxic if swallowed Toxic in contact with skin Toxic if inhaled
	Category 3	Acute Tox. 3	 GHS07	Warning		H302 H312 H332
	Category 4	Acute Tox. 4				
Skin corrosion / irritation	Category 1A	Skin Corr. 1A	 GHS05	Danger	H314	Causes severe skin burns and eye damage
	Category 1B	Skin Corr. 1B				
	Category 1C	Skin Corr. 1C				
	Category 2	Skin Irr. 2	 GHS07	Warning	H315	Causes skin irritation
Serious eye damage / eye irritation	Category 1	Eye Dam. 1	 GHS05	Danger	H318	Causes serious eye damage
	Category 2	Eye Irr. 2	 GHS07	Warning	H319	Causes serious eye irritation
Sensitisation of the respiratory tract or the skin	Respiratory Sensitisers Category 1 and Sub-Categories 1A and 1B	Resp. Sens. 1 1A or 1B	 GHS08	Danger	H334	May cause an allergy or asthma symptoms or breathing difficulties if inhaled
	Skin Sensitisers Category 1 and Sub-Categories 1A and 1B	Skin. Sens. 1 1A or 1B	 GHS07	Warning	H317	May cause an allergic skin reaction

Classification			Labelling			
Hazard- Class		Abbreviation of classification (without H set)	Pictogram, code*	Signal -word	Code*	Warning of danger Text
Category						
Germ cell mutagenicity	Category 1 and Sub-Category 1A and 1B	Muta. 1, 1A or 1B	 GHS08	Danger	H340	May cause genetic defects ⁽³⁾
	Category 2	Muta. 2			Warning	H341
Carcinogenicity	Category 1 and Sub-Category 1A and 1B	Carc. 1, 1A or 1B		Danger	H350	May cause cancer ⁽³⁾
	Category 2	Carc. 2			H350i	May cause cancer when inhaled
			Warning	H351	Suspected of causing cancer ⁽³⁾	
⁽³⁾ = State route of exposure if it is conclusively proven that no other routes of exposure cause the hazard.						
Reproductive toxicity	Category 1 and Sub-Categories 1A and 1B	Repr. 1, 1A or 1B	 GHS08	Danger	H360 ⁽⁴⁾	May damage fertility or the unborn child.
	Category 2	Repr. 2			H360F ⁽⁵⁾	May damage fertility.
			H360D ⁽⁵⁾	May damage the unborn child		
				H360FD ⁽⁵⁾	May damage fertility. May damage the unborn child.	
					H360Fd ⁽⁵⁾	May damage fertility. Suspected of damaging the unborn child.
					H360Df ⁽⁵⁾	May damage the unborn child. Suspected of damaging fertility.
	Additional category for effects on or via lactation	Lact.	No Pictogram	No Signal Word	H362	May cause harm to breast-fed children.
⁽⁴⁾ = (state specific effect if known)(state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard) ⁽⁵⁾ F = Fertility, D= Development (lowercase f, d = suspected effect)						
Specific target organ toxicity (single exposure)	Category 1	STOT SE 1	 GHS08	Danger	H370	Causes damage to organs ^(6,7)
	Category 2	STOT SE 2		Warning	H371	May cause damage to organs ^(6,7)
	Category 3	STOT SE 3		 GHS07	Warning	H335
H336						May cause drowsiness or dizziness
Specific target organ toxicity (repeated exposure)	Category 1	STOT RE 1	 GHS08	Danger	H372	Causes damage to organs ⁽⁶⁾ through prolonged or repeated exposure ⁽⁷⁾
	Category 2	STOT RE 2		Warning	H373	May cause damage to organs ⁽⁶⁾ through prolonged or repeated exposure ⁽⁷⁾
⁽⁶⁾ = (state all organs affected, if known) ⁽⁷⁾ = (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)						

Classification			Labelling			
Hazard-		Abbreviation of classification (without H set)	Pictogram, code*	Signal-word	Code* Warning of danger	
Class	Category					Text
Aspiration Toxicity	Category 1	Asp. Tox. 1	 GHS08	Danger	H304	May be fatal if swallowed and enters airways
Hazardous to the aquatic environment	Acute Category 1	Aquatic Acute 1	 GHS09	Warning	H400	Very toxic to aquatic life
	Chronic Category 1	Aquatic Chronic 1			H410	Very toxic to aquatic life with long lasting effects
	Chronic Category 2	Aquatic Chronic 2		No Signal Word	H411	Toxic to aquatic life with long lasting effects
	Chronic Category 3	Aquatic Chronic 3	No Pictogram	No Signal Word	H412	Harmful to aquatic life with long lasting effects
	Chronic Category 4	Aquatic Chronic 4			H413	May cause long lasting harmful effects to aquatic life
Hazardous to the ozone layer	Category 1	Ozone 1	 GHS07	Warning	H420	Harms public health and the environment by destroying ozone in the upper atmosphere

* = The Code for the Pictogram and the H-statement do not need to be included on the label.

Classification and Labelling is a set of criteria and rules used to determine if a chemical can cause harm to human health and the environment. It involves the identification and evaluation of the physical properties of a chemical, along with its health and environmental effects and then communicating those hazards via a label.

The CLP Regulation (EC) No 1272/2008 on classification, labelling and packaging (CLP) of substances and mixtures entered into force on the 20th January 2009 and is direct acting in all European Member States. It has a phased transitional period, firstly for substances since the 1st December 2010 and applies to mixtures from the 1st June 2015, with a derogation until the 1st June 2017 if the mixture is already "on the shelf".

CLP introduces the United Nations GHS into Europe and replaces the existing European Directives 67/548/EEC for substances and Directive 1999/45/EC for preparations. These were transposed in Ireland by Statutory Instruments S.I. No 116 of 2003 (for substances) and S.I. No 62 of 2004 (for preparations).

These will be repealed from 1st June 2015 when CLP becomes fully operational.

The Competent Authorities under the Chemicals Acts 2008 and 2010 in Ireland for the CLP Regulation are the Health and Safety Authority, for industrial chemicals, and the Pesticide Registration and Control Division of the Department of Agriculture, Food and the Marine for plant protection products and biocides. There is a Chemicals Helpdesk established to assist industry to meet their obligation under CLP.

Further sources of information, assistance and guidance can be found at the following:

HSA website www.hsa.ie/clp

Chemicals Helpdesk email chemicals@hsa.ie
Telephone 1890 289 389

ECHA website http://echa.europa.eu/clp_en.asp

The content of this poster is subject to change as a result of adaptations to technical progress to the CLP Regulation please check the HSA and ECHA websites for updates. The HSA wish to acknowledge and thank the German Competent Authority, BAUA who provided the information on which this poster is based.

- Before using any hazardous substance or chemical, please read the relevant material safety data sheet and the corresponding IMT operating instructions for the handling rules. Material safety data sheets are to be provided by the supplier free of charge.
- Hazardous substances and chemicals may only be stored in containers that are shaped and labeled such that they cannot be confused with food / food containers.
- Labeling of the containers shall be made clearly and unambiguously using a proper label with at least one simplified characterization as described above. Over-sticking or over-writing of old labels shall not be permitted.
- Also wastes of hazardous substances shall be labeled.
- Packages containing no hazardous substances shall also be labeled clearly and permanently with the designation of the ingredient at least.
- For all hazardous substances and hazardous substance groups as well as for highly dangerous activities with certain setups, operating instructions shall be kept on site. Collective operating instructions have proved valuable and shall be permitted (e.g. halogenated or halogen-free solvents). However, single operating instructions shall be required for highly hazardous substances (e.g. substances dangerous to life, carcinogenic, mutagenic, toxic for reproduction, self-inflammable, and explosive substances).
- Setups and pipelines shall be labeled such that at least the hazardous substances contained and the hazards caused by them can be identified clearly.
- Hazardous substances shall be documented regularly in terms of type, quantity, and properties (hazardous substances register). Documentation can be made on data carriers. It shall be ensured that information on the substances existing may be provided any time on request. Use of the database “Chemieassistent (ChemA, Chemicals Assistant)” as a register of hazardous substances shall be mandatory.
- If substitutes of hazardous substances are known, these shall be used. Substitution shall be documented in the corresponding risk assessment.
- Hazardous substances shall be stored such that qualified persons only have access. Trained laboratory staff shall be considered to be qualified. Substances and preparations / mixtures classified as toxic, dangerous to life, carcinogenic category 1 or 2, mutagenic category 1 or 2, and toxic for reproduction category 1 or 2 shall be kept under lock or stored such that only qualified and reliable persons have access. Activities with these substances and preparations / mixtures as well as with substances and preparations / mixtures sensitizing the respiratory tract shall only be performed by qualified or specially instructed persons.
- Toxic substances shall be stored separately from easily flammable substances.
- Hazardous substances shall only be stored at the laboratory in amounts for use in the hand. These amounts are defined by TRGS 526, section 3.3.3 and TRGS 510. Any additional amounts shall be stored in appropriate storage rooms or licensed safety cabinets.
- When storing hazardous substances, potential restrictions of mixed storage (TRGS 510) shall be observed.

- Hazardous substances irritating the skin and eyes or releasing toxic vapors or highly inflammable and self-inflammable hazardous substances shall always be handled in hoods.
- Spent hazardous substances and hazardous substance solutions / mixtures shall be collected and stored properly at the laboratory and transferred to the waste collection center as “hazardous waste”.
- Transportation of hazardous substances in fragile pots may only be performed with safe transport over-containers (e.g. in plastic buckets or metal boxes).
- For handling hydrogen fluoride / hydrofluoric acid, a special instruction shall be required (“Flusssäurepass” = Hydrofluoric acid pass).

10. HANDLING OF GASES

- Pressurized gas bottles shall only be put up reliably outside of the laboratories. The gases shall be supplied to the workplaces via permanent, technically tight, and stationary pipelines.
- Pressurized gas cylinders shall not be left at the laboratories after the end of work or overnight, but shall be returned to the bottle storage facility or kept at another safe place (e.g. safety cabinet according to DIN EN 14 470-2, outdoor laboratory).
- Rooms, in which pressurized gas cylinders are put up, shall be marked with a corresponding warning sign according to ASR A1.3 (ASR = Technische Regel für Arbeitsstätten = Technical regulations for workplaces) on the doors.
- Gases may be only withdrawn from gas cylinders via additional valves fixed to the cylinder valve (specific of each type of gas).
- Valves shall only be exchanged by instructed employees.
- Pressurized gas hoses shall be secured to prevent them from sliding off.
- Pressurized gas cylinders shall not be opened forcibly. Pressurized gas cylinders that cannot be opened shall be labeled and returned to the supplier.
- Pressurized gas cylinders with toxic (H330, H331, R23, R26), oxidizing (H270, R8) or inflammable (H220, H221, R12) gases shall be put up permanently vacuumed (120 times air exchange in case of toxic, 10 times air exchange in case of other substances) (e.g. in a safety cabinet). When using smaller pressurized gas cylinders or “lecture bottles”, these shall be put up in the direct vicinity of the hood or better inside, if possible.
- Use of extremely toxic gases (e.g. hydrocyanic acid, phosgene, hydrogen sulfide) shall only be permitted in special, well-ventilated rooms (stinking rooms) and shall require a permit in writing by the responsible laboratory manager.
- At the laboratory, pressurized gas cylinders shall be secured against falling by a steel bracket and a chain / belt.
- Pressurized gas cylinders shall be moved only with special transport vehicles, an applied safety chain, and a valve cap. Carrying the bottles is strictly forbidden. Transportation should be made by two persons.

- When transporting pressurized gas cylinders and vacuum flasks with liquid nitrogen or helium in elevators, external control shall be used. Taking along of other persons shall be forbidden! If available, use the goods elevator!
- Liquid nitrogen in vacuum flasks shall always be covered in order to prevent condensation of oxygen from the air. Never use a tightly sealing lid, as this might cause a dangerous overpressure.
- Storage of pressurized gas cylinders is defined in TRGS 510, making available and handling / operation of pressurized gas cylinders shall be subject to TRGS 745.
- Pressurized gas cylinders that are no longer needed or empty shall be returned to the supplier immediately.

11. LABORATORY HOODS (DIGESTORS)

- The front slide of hoods shall be kept closed, required interventions shall be made via the intervention holes (panes movable to the sides).
- Exhaust air sliding diaphragms at the rear wall of older hoods shall always be kept open.
- Sitting in front of open hoods during reactions is dangerous and, hence, forbidden.
- Functioning of the hoods shall be controlled permanently (older models: Paper strips or wool threads; new models: Optical and acoustic displays).
- Hoods are subject to recurrent inspection and, hence, shall be inspected regularly according to the inspection deadlines defined in the risk assessment (functional test at least every year, permanent monitoring systems check at least every three years). The inspections shall be made by qualified persons (e.g. operations engineers). In hoods marked as “defective”, no handling of hazardous substances shall be allowed. Any other use shall be agreed upon with the responsible occupational safety specialist.
- The superior and the fault desk (Phone 5555) shall be informed immediately about defects of hoods.

12. REFRIGERATORS, FREEZERS, AND COOLING CHAMBERS

- Containers that are to be stored in refrigerators and cooling chambers shall be closed and marked in sufficient detail with the contents and name of the user. Once a year at least, it shall be checked whether these containers have to remain in the refrigerators / cooling chambers or may be disposed of.
- Burnable liquids that have to be stored in a cool place shall only be kept in refrigerators, if their interior is free of ignition sources (illumination removed, thermostat outside). Quantities shall be restricted to volumes used in the laboratory. The cooling chambers and freezers shall be marked with the label “Nur Innenraum frei von Zündquellen“ (Interior free of ignition sources only). Refrigerators, whose interior is not free of potential ignition sources, shall be marked with the sign “In diesem Kühlschrank ist das Aufbewahren

brennbarer Stoffe verboten“ (Storage of burnable substances is forbidden in this refrigerator).

- Refrigerators, in which toxic substances are stored, shall be made lockable and kept locked.
- Refrigerators containing substances that are expected to decompose explosively in case of uncontrolled heating up to room temperature shall always be connected to emergency power supplies.
- Refrigerators and freezers shall be defrosted regularly, except for “no frost” models with an automatic defrost function.
- Mixed storage of food (food and beverages) with chemicals shall be strictly forbidden.

13. WORKING WITH LASER SOURCES

- Potential hazards by laser sources must be indicated at the entrance doors of the laboratories by warning signs, lights, and/or labeling according to the technical rules for laser radiation.
- A Laser Safety Commissioner shall be appointed in writing for laser classes 3R, 3B, and 4 and for laser classes 1M and 2M, if the direct view into the beam with the help of optical devices represents a hazard.
- Laser sources may only be operated by verifiably instructed persons. When the facility and/or laser source is inactive, it must be protected against unauthorized use.
- It must be ensured that nobody accidentally steps or looks into the laser beam.
- Persons shall avoid looking into the laser beam, also when they wear safety glasses.
- Reflecting objects shall be removed from the laser area. Rings and bracelets shall be removed when working on the laser system.
- Combustible or explosive substances must be removed from the laser area.
- Additional protective measures shall be agreed upon with the Laser Safety Commissioner. The measures shall be specified in the risk assessment.

14. WORKING WITH ELECTRICITY

- All electrical equipment (e. g. machines, installations, devices) shall be tested before first commissioning, after repairs, and recurrently in accordance with DGUV rule 3.
- Electrical equipment shall only be set up, modified or maintained by qualified electricians or under their direction and supervision.
- Electrical equipment must not be put into operation when the inspection period has expired (these e.g. inspection stamp).
- Electrical equipment must not be set up in areas that may get into contact with splashing water.

- Fuses of electric devices or in-house installations may only be exchanged or reinserted by qualified electricians or under their direction and supervision.
- Defective electrical equipment or fuses shall be withdrawn from use and repaired or disposed of. The person that withdrew the equipment from use shall mark it temporarily with the reason of the defect, date, name (in block letters), and signature.
- Multiple sockets shall not be connected in series.
- Extension cables shall be used such that no risk of tripping results and the cables shall not be bent or squeezed.

15. WASTES

- The Waste Management Regulations of KIT shall apply. Detailed information can be found in the KIT information security system (KISS: <http://www.kiss.kit.edu/>). First contact person at IMT for the waste management is Mr. Mathias Gramlich.
- All waste collection containers shall be labeled such that it can be seen clearly and permanently which substances / fractions are collected in which container. Waste collection containers containing hazardous substances shall be marked according to the Chemikaliengesetz (Chemicals Act).
- All types of waste shall be collected separately in the respective containers.
- Use of containers other than those distributed by the interim waste storage facilities (in particular, former cleaning agent containers) shall be forbidden.
- Wastes shall be collected separately according to sorts, if possible. Any mixing in particular of solid inorganic wastes shall be avoided.
- The containers shall be marked clearly and kept at a safe place (e.g. in collection tubs under the hood or in the safety cabinet).
- Storage of waste canisters in washbasins / laboratory basins shall not be allowed.
- Mechanically hazardous wastes, such as broken glass or cannulas, shall be packaged safely.
- Spilled mercury shall be taken up with suitable adsorption granules. Application of zinc or sulfur powder, which was usual practice in the past, shall be avoided, as it is hardly efficient and makes disposal unnecessarily complicated.
- Reactive and highly hazardous wastes (alkali metals, metal hydrides, cyanides, catalysts, acids, and brines, etc.) shall be deactivated before transfer to the interim waste storage facility. In cases of doubt, contact the Waste Management Center (phone 22222). There, you may also obtain instructions for the disposal of reactive wastes.
- Depending on their quality, chemicals in original packages may either be offered on the chemicals exchange platform (ChemA) or registered for disposal as laboratory chemicals.

16. LEAVING THE ORGANIZATIONAL UNIT

When staff members leave IMT, the following regulations shall be observed:

- All chemicals shall be returned to other users (with handover certificate) or disposed of, if necessary.
- The laboratory shall be left in a clean and tidy state.
- All keys will be returned to the respective building manager.
- All original spectra, analyses, and laboratory journals shall be given to their supervisor.

Karlsruhe, November 04, 2016